In This Issue—*Analysis of 1921-22 Chandler Electrical System*

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JUL 14 1922

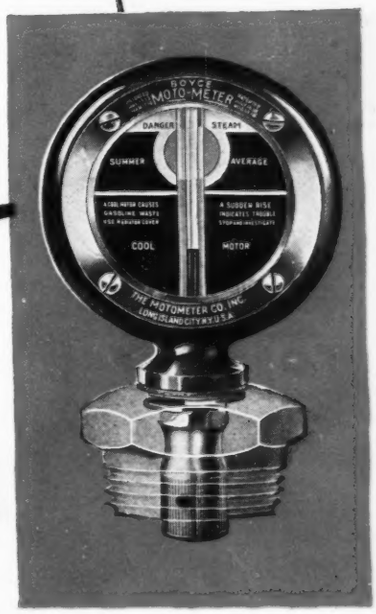
MOTOR AGE

Vol. XLII
Number 2

PUBLISHED WEEKLY AT THE MALLERS BUILDING
CHICAGO, JULY 13, 1922

Thirty-five Cents a Copy
Three Dollars a Year

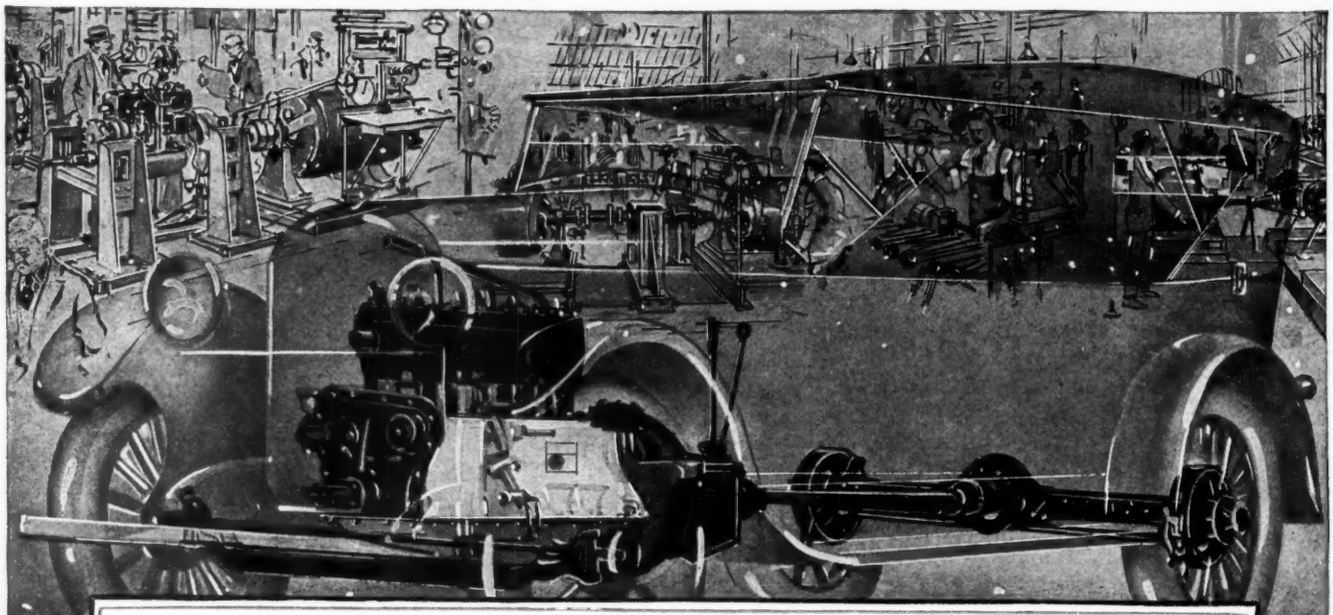
Again!
WESTERN UNION
TELEGRAM
NEWCOMB CARLTON, PRESIDENT
GEORGE W. E. ATKINS, FIRST VICE-PRESIDENT
CLASS OF SERVICE | SYMBOL
Telegram | Blue
Day Letter | Nite
Night Message | N L
Night Letter | N L
1922 MAY 31 AM 2 29
RECEIVED AT
28ND 36 NL
INDIANAPOLIS IND 30
BOYCE MOTOR METER CO
LONGISLAND CITY LONGISLAND NY
WON FIVE HUNDRED MILE RACE HERE TODAY BREAKING TRACK RECORD
THAT HAS STOOD SINCE NINETEEN FIFTEEN AVERAGING NINETY FOUR
AND FORTY EIGHT HUNDRED MILES PER HOUR BOYCE MOTOR METER WAS
MY ONLY INSURANCE AGAINST MOTOR TROUBLE
JIMMY MURPHY.



BOYCE MOTO METER

"Your car deserves one"

Entered as second class matter Sept. 19, 1899, at the post office at Chicago, Ill., under Act of March 3, 1879.



Back of the SPECIALIZED Vehicle

Skill and equipment concentrated to a degree not possible in any one organization

Today the buyer of a passenger car or motor truck looks not only at the vehicle but, with keen understanding, at the production methods and standards back of it.

The SPECIALIZED vehicle holds his interest because in each of its major units it represents concentration of skill, specialized training and specialized equipment. No lost motion, no dissipated energies—but the undivided and untiring attention of SPECIALISTS to each unit until, in material, in mechanical principle and in operation, perfection is achieved.

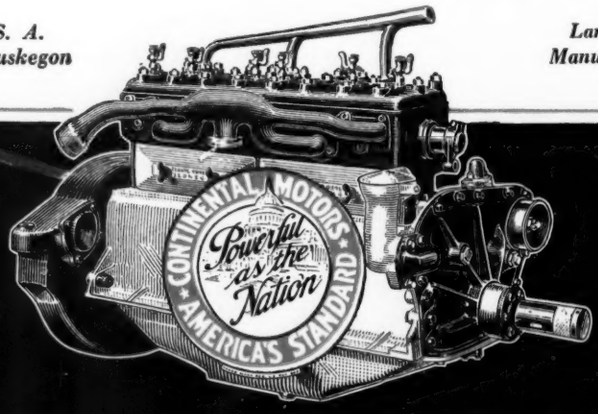
Add to this the efficient distribution of genuine replacement parts in parts-stations throughout the world—and you have the reason for the growing demand for the SPECIALIZED vehicle—the vehicle of proven units.

Dealers' service organizations are particularly concerned with this parts distribution policy—a policy that means to them the ability to give better service at less cost. It is obviously to their advantage to further the sale of the SPECIALIZED car and truck—the demand for which is sustained by the matchless service of such proven units as that recognized standard of motor dependability—the Continental Red Seal.

CONTINENTAL MOTORS CORPORATION

Offices: Detroit, U. S. A.
Factories: Detroit and Muskegon

Largest Exclusive Motor Manufacturers in the World



Continental Motors

MOTOR AGE

Published Every Thursday by
THE CLASS JOURNAL COMPANY
MALLERS BUILDING
59 East Madison Street, CHICAGO

Vol. XLII. Chicago, July 13, 1922 No. 2

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SUBSCRIPTION RATES
United States, Mexico and U. S. Possessions ..... $ 3.00 per year
Canada ..... 5.00 per year
All Other Countries in Postal Union ..... 6.00 per year
Single Copies ..... 35 cents
Subscriptions accepted only from the Automotive Trade

Entered as Second Class Matter Sept. 19, 1899, at the Post-Office at Chicago, Ill., under Act of March 6, 1879.

TURNER

2 IN 1

TIMER
For All
Ford Motors

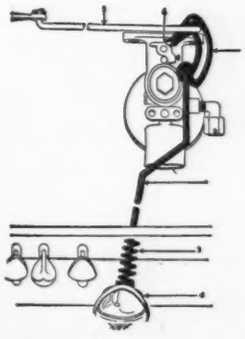
Five years of repeated tests have proven the TURNER TIMER to be a genuine quality product and a boon to every owner of Ford cars, trucks and tractors. It gives increased power, assures an easy start in any weather, lessens fouling of two front plugs, saves gasoline and stops motor "kicking". It is oil, grease and water proof. Requires no oiling and is easily installed. Furnished complete with "short proof" wiring assembly in metal conduit.

Eleven points of superior construction.

Write today for information on this accessory that is breaking all previous sales records.

Price complete with wiring assembly $3.60

Ford Foot Accelerator

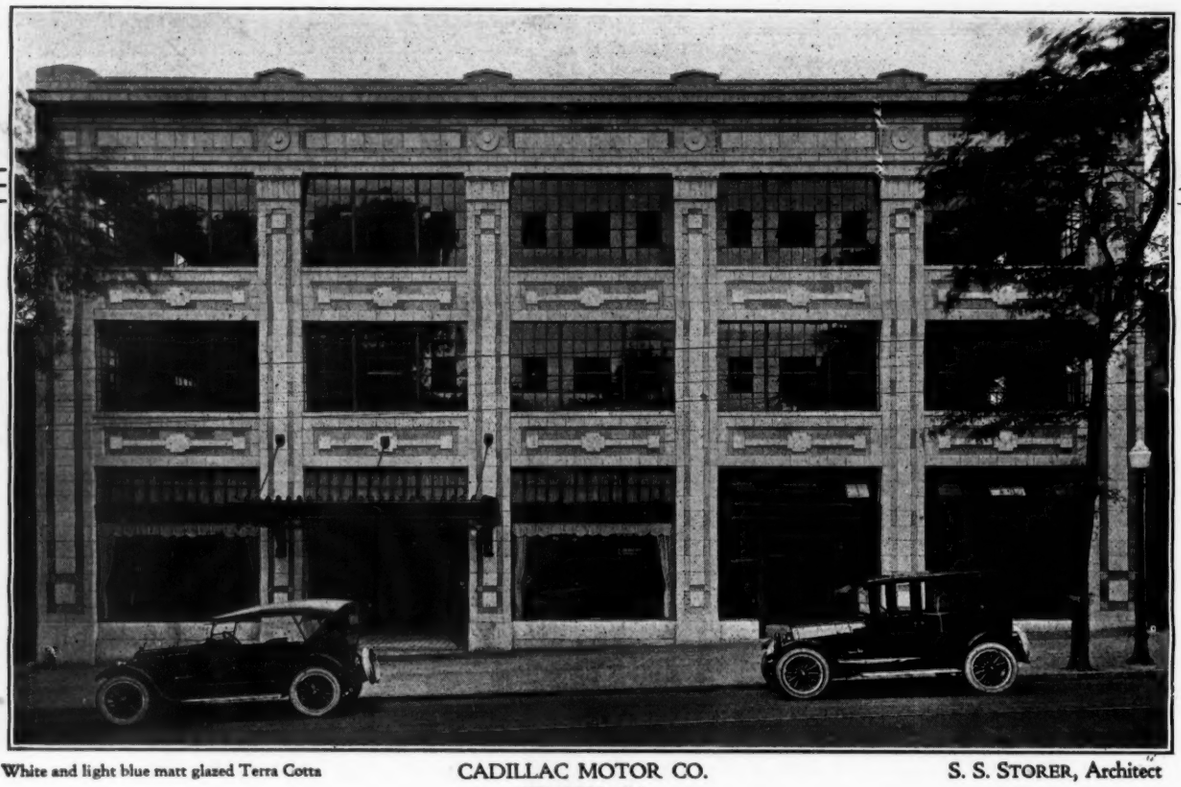


The Turner Instant Foot Accelerator for Fords can be instantly installed by anyone. Permits positive and quick throttling when you need it. Gives use of both hands in driving. Has positive and direct connection with carburetor. Nothing to shake loose and rattle or cause lost motion. Large foot pedal and foot rest add to car appearance. Price complete $1

Spring Leaf Lubricator

Greatly increases riding qualities, stops squeaks and spring breakage and increases spring wear. Makes steering easier and saves tires. Only device that spreads spring leaves and lubricates at same time. For all cars. Price $2.50

TURNER MANUFACTURING CO.
KOKOMO, INDIANA



White and light blue matt glazed Terra Cotta

CADILLAC MOTOR CO.
ATLANTA, GA.

S. S. STORER, Architect

Problem: MAXIMUM WINDOW SPACE *plus an* ATTRACTIVE EXTERIOR

"DISPLAY windows are as important to automobile sales buildings and garages as they are to dry goods stores." That's what a local Cadillac manager told us.

How completely the Cadillac Motor Co. Building at Atlanta, Ga., meets these requirements is clearly indicated by the picture above. Here is a sales building that makes sales. Its exterior is attention-compelling—its window-space, ample.

Ordinarily large window-space detracts from the exterior appearance; but by the use of Terra Cotta—in this case in two colors—the architect can give a building with narrow piers very definite attractiveness. The lighter portions are white matt glazed Terra Cotta; the darker portions—the narrow panelings on the pilasters and backgrounds of the spandrels between the stories—are light blue.

Terra Cotta comes in any form or color desired, and admits of distinctive decorative treatment at moderate cost. It is highly fire-resistant, permanent in finish, color and texture. Should it become dirty, it can always be washed off with soap and water, and its original freshness restored.

If you are planning a garage, salesroom, or service station, write us about it. We can send you information which may save you time and money. Address **National Terra Cotta Society,** 19 West 44th Street, New York, N. Y.

TERRA COTTA

Permanent Beautiful Profitable

Vol. XLII, No. 2 Chicago, July 13, 1922 $3 Per Year

MOTOR AGE

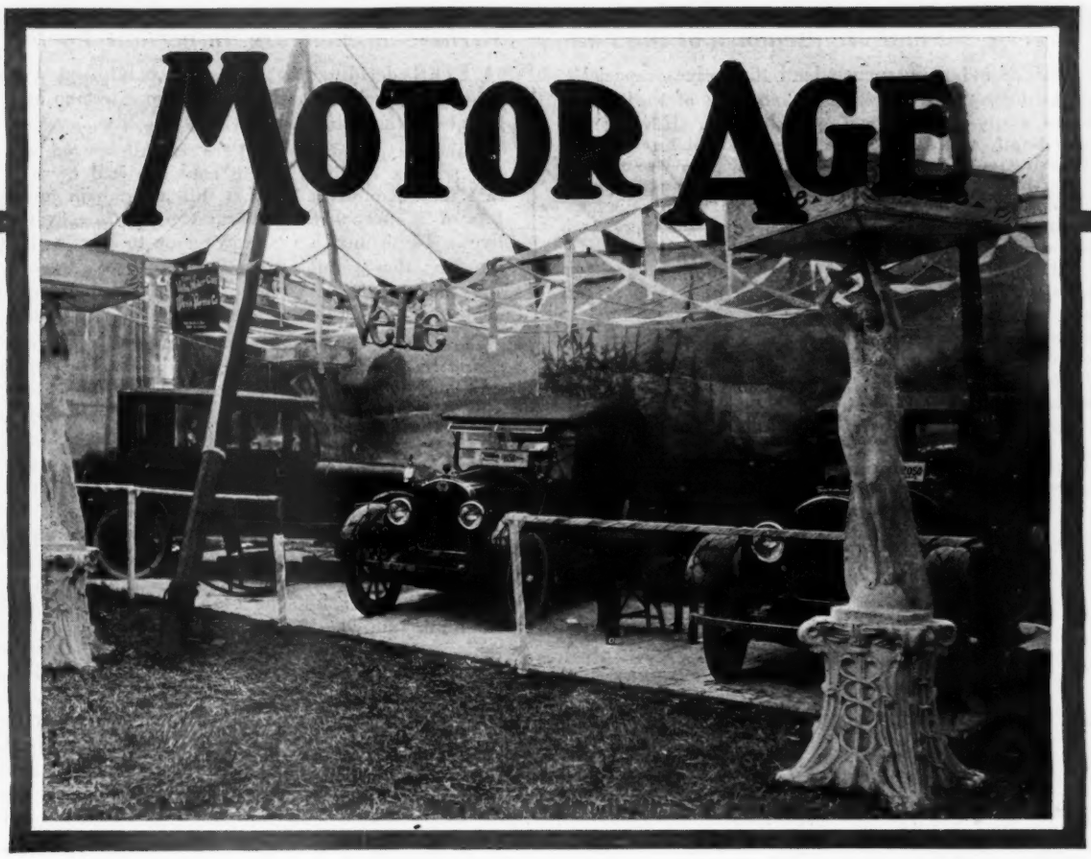


Exhibit of Velie cars by the Webb Motor Co. at the city fair in Berkeley, Cal., a city of approximately 60,000 inhabitants. This exhibit sold a car a day for the six days of the fair, and received calls for demonstrations from 103 prospects

Don't Overlook *Your* Home-Town Fair

Town and County Exhibitions Present an Excellent Opportunity to Dealers to Sell Cars and Maintenance

Profit by Broader Application of *"Ask 'Em to Buy"*

HAVE you a little fair in your town? If you have, don't overlook it, for sure it is one of the best opportunities to sell automobiles that you will have all the year 'round. Likewise, it is the best place to impress on all your townspeople, and all those who live in your territory, that you do the best repairs, give the best service, and charge the fairest rates of all the repair and maintenance stations these same people are likely to use. Thus, in this case, what is good for the automobile dealer, is good for the garage and service man.

This is the milk in the cocoanut which dealers and garage men of northern California have knocked off the tree of business. They got their greatest demonstration of the truth of it in the annual city fair at Berkeley, about seven miles east of San Francisco, and right in the heart of what is supposed to be "big-town" territory in automobile selling. This fair has just closed its second edition, the first exhibition having been held in August, 1921. Virtually all the dealers in cities of this size—60,000—and smaller, also operate garages and maintenance stations so the experience of the dealers who exhibited in these fairs goes for both kinds of business. The results here set down have made

Selling Accessories and Maintenance at the Fair

ACCESSORIES and maintenance lend themselves especially to Fair exhibits. The accessories should be of the simple type that are easily handled and quickly sold. Have something in the booth and a good many people will buy with a quick demonstration. For instance, an all-purpose wrench for Fords, with a background of wrench sets for the cars popular in your community. It is likely that a good many persons coming to the fair have experienced the need of bumpers, and these safety devices should interest right then and there these victims of bumps. Sell the prospect the bumper, get his money and then send him around to your regular shop to get it attached.

Maintenance operations lend themselves to an interesting exhibit. A precision machine will attract attention. Take some article of your recently bought equipment machinery to the fair grounds, get some old parts to demonstrate it with and show the people exactly how well you do this work in your shop.

It does not require much ingenuity to arrange such an exhibit and there is money in it.

Right Salesmen are Important Factor at Fairs

AFTER deciding that you will exhibit at a Fair proceed cautiously in the selection of the salesmen and other helpers about the exhibit.

Some very good salesmen are worthless, even an actual drawback, at an exhibit. These men are still boys to the extent that they cannot realize that this assignment means work and lots of it, probably the hardest work they ever did in their lives. These men have always gone to fairs as participants in the fun; they cannot resist the temptation to join in the fun and the sight of a pretty girl will cause them to not only neglect prospects but to be actually rude to them.

Then there is the other man who takes this assignment so seriously that he annoys people who merely stop to look and who may, of their own accord, become interested. This sort of a man apparently believes that every passerby who glances at his exhibit is morally bound to buy the vehicle.

It is a big job, this selection of the salesmen, and it is quite as important as the decision to exhibit.

"fair fans" of every dealer on the eastern shore of San Francisco Bay. From now on they are going into every town and county fair—no matter how small—in their territory.

Four Points of Benefits

These dealers have found four points at which the town and county fair gets them business—better business, as a cold fact, than any automobile show in which they ever have exhibited. These four points are worth pasting in your hat; they are:

1—Actual sales from the floor.
2—Immediate prospects in position to buy.
3—Co-operative friendship with their townspeople.
4—Future prospects and their exact standing.

Four dealers exhibited at this fair. In such fairs, the exhibitors usually are limited to men in business in the town or city giving the fair. This is an advantage to the small-town automobile dealer, as will be shown out of the mouth of one of these exhibiting dealers in just a minute. The dealers who exhibited were Bell & Boyd, with the Overland; C. McCarron, Chevrolet; Webb Motor Co., Velie; and Nelson Scotchler, with the Ford. Equipment firms exhibiting in the same fair were the No Shock Spring Co., the Diamond Signal Co., the Auto Signal Stop Co., and the Patterson Visor Co.

C. R. Webb,, president of the Webb Motor Co., who exhibited in last year's fair, and again in this year's fair, and who now is out looking for other small-town fairs to conquer, made a survey of the results of the Berkeley exhibitions, as a fair test of the worth of automotive displays in fairs in the smaller cities and towns. When he got it all figured out, he told it like this:

"We get results from our exhibits at the town fair each year clear up to the opening of the next year's fair, and, aside from this, we get greater and more definite actual sales results from an exhibit which costs us about $250 at the Berkeley Fair each year, than we do from the exhibits which cost us as high as $750 or $800 at the regular automobile shows. The people who go to automobile shows are largely automobile 'fans'; many of them are curiosity seekers; almost all of them have cars of their own; they do not offer a field of prospects of anything like the size of that presented by the attendance at the town or county fair. The automobile show is highly specialized; it is for those who are interested in automobiles, largely for those who already have automobiles. The town or county fair attracts people who are interested in other things than automobiles, and who never go to the show held exclusively to exhibit motor cars.

A Builder of Prestige

"These people, at the town or county fair, where the automobile exhibit is aided by the other displays, gravitate from the exhibits of things in which they are interested to the automobile section. There they see from four to ten different makes of cars exhibited, instead of seventy-five to a hundred, as in an automobile show. They are not confused by the number and the differences of the cars. They have time to look over each car; they get acquainted, really acquainted, with the dealer in their own home town, and, if they have not already done so, they begin to regard him as one of their own institutions, just like their grocer, their dry-goods merchant, or their druggist.

"Almost every American would prefer to make all his purchases in his own home town, provided he can get the things, from socks to automobiles, that will serve him best. And the automobile dealer in the small city or town, who knows every man and woman in his territory has a tremendous advantage, and an enormous advertising power for himself, for, if they all know him, whenever one of his townspeople thinks of an automobile—in the way of purchase or repairs—he thinks of the dealer he knows, of Bill Jones, his own hometown dealer or repair man. There is no method by which this acquaintance can be extended and these friendships strengthened so successfully as the regular placing of an exhibit in the home-town or home-county fair.

"In the automobile show, too,

A Truck Exhibit Could Be Handled This Way

THE county fair is the natural place to exhibit a truck and with the chassis there should be an exhibit of as many styles of bodies as the exhibitor can obtain.

After all, the chassis of a truck is the minor factor in the use. The body is the thing that makes it applicable to the problem the man with freight to haul has in his mind. The purchaser today can assume that any one of many trucks can do his work but he cannot assume that a dump body will be suitable for his purposes if the freight he has to haul does not lend itself to dumping.

One truck chassis with a dozen bodies would be an excellent exhibit. The truck prospect is usually a practical man, with very definite ideas of his own work. It is not to his discredit to say that he may lack somewhat in imagination. Dealers who have been successful in selling trucks to farmers and small contractors have used the body to a very distinct advantage in putting over these sales.

The success of "Trucktown" at the Wisconsin State Fair at Milwaukee is well known. An imposing entrance to the truck exhibits was erected, displaying the name "Trucktown" in regulation "fair style." The exhibit spaces were liberal in size and each exhibitor had a temporary building as an office, where special literature was kept and where sales contracts could be signed. More than 60,000 people visited this collective exhibit the first year.

there is no 'filter' for the crowds. Everybody goes to see automobiles and nothing else, and those who are not especially interested in automobiles do not go. In the town or county fair, the other displays scatter and thin out the crowd, so that the people come in smaller numbers at a time to the automobile exhibits. They get greater opportunity to see each car, and they give the exhibitor greater and better chance to make his talk. They remember man, talk and car better because they are not confused by a large variety of cars and a large number of arguments made by many exhibitors and salesmen, as they are at an automobile show.

"The dealer's display at the fair takes on the character of an exhibition, or part of a big show, rather than a mere advertisement, or a selling game, as a great many people have come to regard the automobile show. The psychology of his own home town comes to the aid of the dealer in the crowd at the fair. Everybody is everybody's friend, and the "let's-put-it-over' spirit is strong, a co-operative sentiment which the automobile dealer cannot afford to ignore.

"Our own experience with these fairs has been most gratifying. The first fair was held in Berkeley in August, 1921, and we got results which lasted until February, 1922, from an exhibit which cost us about $150, all told. By 'results' I mean sales. For nearly six months after this fair, acquaintance, friends and prospects made at that first exhibition, bought cars from us. We expect, from the results already gained from the 1922 fair, just closed, to be feeling the effects of it for at least a year.

"We sold six cars—none of them to previous prospects—from the floor of the fair; we got the names and addresses of 103 responsible persons who asked for demonstrations; and we took more than 70 names of other persons who will be in the market for new cars at certain times in the near future, dependent on returns from crops, loans, and similar financial factors.

"We did a good business in January, but February fell off a little. March was equal to January, April doubled the January business, and May, largely due to the fair, doubled April. We have every reason to believe that June, due in large part to results of the fair, will show abusiness double that of May.

"Times are better, and our 'get-acquainted' campaign at the Berkeley Fair enabled us to take advantage of this improvement in the general agricultural, commercial and financial condition in our territory. We believe the town and county fair offers one of the widest opportunities, and is one of the greatest aids, to the automobile dealer who uses them to get close to his own townspeople rather than merely to sell cars."

How to Exhibit at County Fairs

AN automobile distributor who is a graduate from the carriage and buggy business and who, of course, is a county fair enthusiast once gave these rules to govern the exhibits at a county fair:

"The vehicles to be exhibited should be of the flashy type. Everybody in the world knows exactly what a somber looking automobile or truck looks like, but a white car, a body of unusual design and color scheme, or otherwise out of the ordinary always attracts attention. People stop to look, then get interested and while 99 per cent of them are not prospects for such a car as you exhibit, they can easily adjust their ideas to their own modest tastes.

"Then, too, some persons are interested in the mechanics of the car. Not many, it is true, but you cannot afford to ignore these. If a stripped chassis is not available just turn a car over on its side so that the people can see what is under the car.

"Never put a car in a fair exhibit that is too nice for people to touch or for people to get in it and sit down. The people who go to county fairs are just ordinary sort of folk, curious about a good many things but thoroughly practical and they want to know how things feel, as well as look. They have come to the fair to be entertained and amused and your car is a part of the entertainment program. Let it be that and you will profit hereby.

One Dealer's Used Car Plan

THE used car is the subject of discussion in a recent communication to MOTOR AGE from Ben Cherakin, sales-manager of the El Paso (Tex.) Overland Co. This writer believes that since 85 per cent of the new car sales involve trade-ins, the used car should cease to be anything but an asset.

"The handling of the used car," he writes, "may be divided into two departments: buying and selling. The former is the determination of the value of the machine while the latter treats upon the proper method of disposing of it."

Cherakin has compiled five questions which he applies to determine the value of a used car. He maintains that the answers to these questions will quickly bring about for the dealer an understanding of the car to be taken in. They follow:

(a) Can the car be re-sold in 30 days?

(b) Is it popular and represented in your territory?

(c) Is the selling price within reach of the used car buyers?

(d) Is it ready to be sold, or does it have to be overhauled?

(e) How much can it be sold for, in about 30 days?

"From 'e' deduct the cost of selling plus a reasonable profit and the balance is what the car is worth." In this way, the Texas man reaches a price for a trade-in.

In disposing of the trade-in, Cherakin believes that the matter of payments has a great deal to do with whether the sale will prove a success or not. He thinks that a used car when sold for 20 per cent down and the balance put over a period of from 12 to 14 monthly payments, a number of such sales will turn up losses, because of the "come-backs" and necessity for repossession.

First Payment 40 Per Cent

"The initial payment," he writes, "must be somewhere around 40 per cent and the balance paid in eight to 10 months, with no note for less than 20 dollars. A sale of this kind is not likely to result in a repossession, because the down payment is sufficient to become an investment. The result is that the car and the deferred notes will receive better treatment.

"Deferred notes should not be allowed to run over a long period. A 'dead line' of ten days should be allowed each purchaser and when that time is run out, a call should be made and if the owner cannot make a payment, repossession should be effected at once, thereby giving the buyers a chance to catch up before final repossession.

"If a trade-in cannot be re-sold within a period of thirty days, the dealer is trading dollars for pennies. There is no need of being afraid that the other dealer will give more for the car—he will not if he wants to stay in business. It is not a good idea to charge part of the profit of the new car sale to the used car purchase if a profit is to be made out of the business."

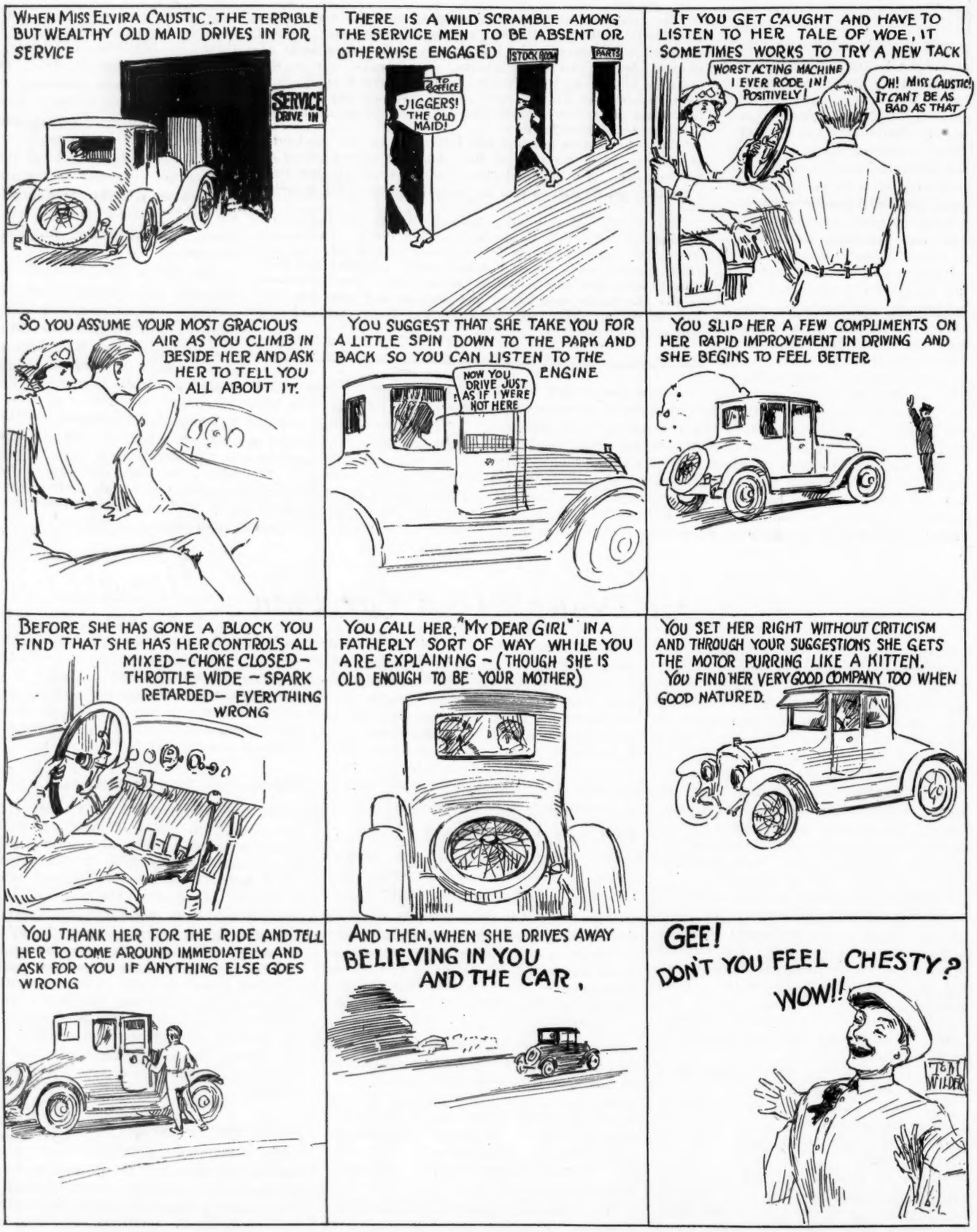
France—New Road Regulations

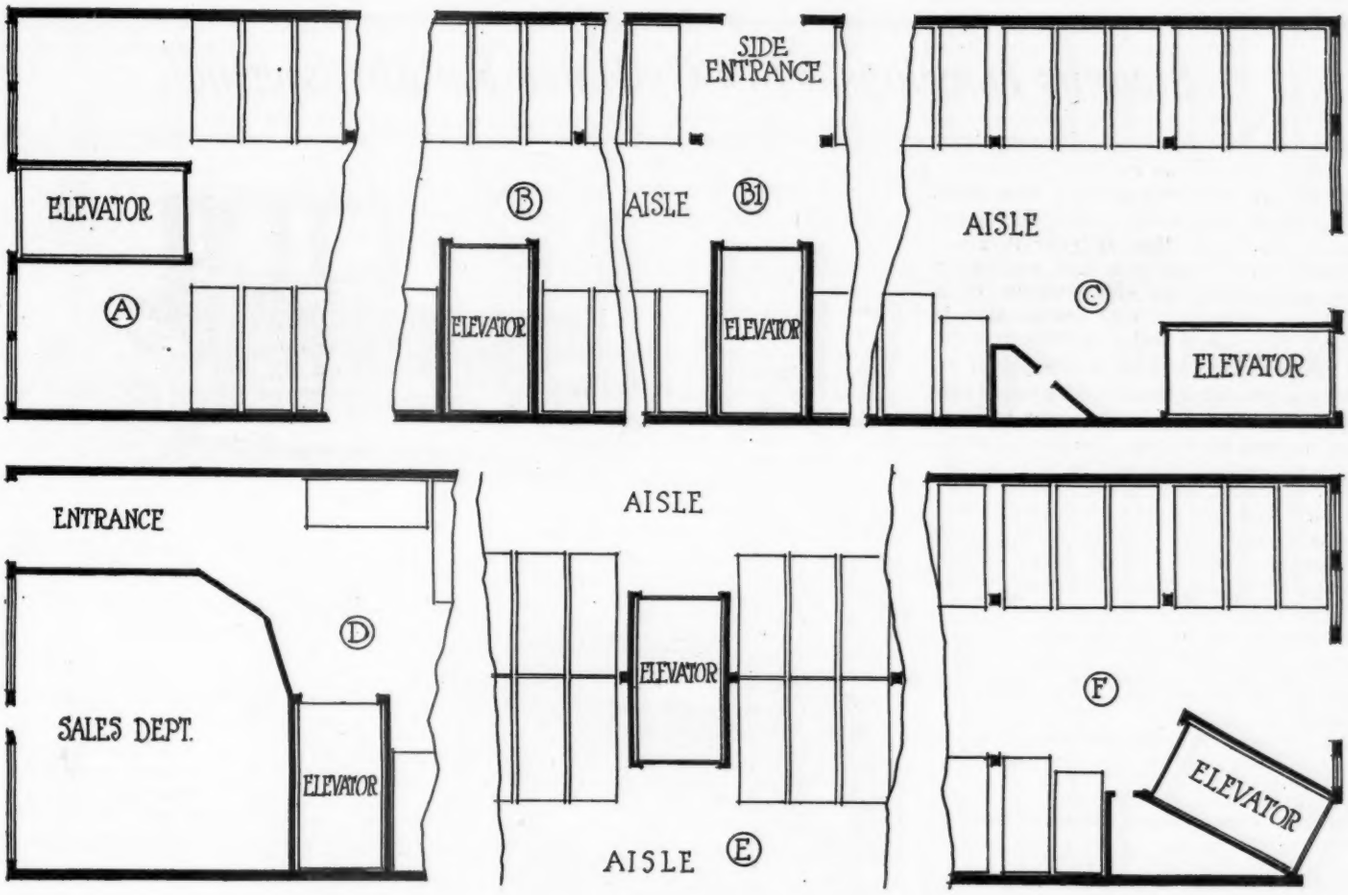
The new regulations for motor vehicles went into effect on May 31, 1922. The new law compels all motor vehicles, except motor cycles, to have two white lights forward and one red light at the left rear after the close of the day. In addition, motor vehicles traveling at a greater speed than 20 kilometers per hour on country roads must have one extra lighting apparatus with sufficient power to light up the road 100 meters ahead. Glaring headlights are forbidden in the cities with public lighting service, and when used outside of the city or town they must not give a light higher than 1 meter above the ground.

Brazil—Modern Garages Established

The first two up-to-date repair and storage garages have been established in Pernambuco during the past few months. They have a capacity for 30 cars each, with full repair facilities, and one of them rebuilds cars.

GEE! DON'T YOU FEEL CHESTY?


WHEN MISS ELVIRA CAUSTIC, THE TERRIBLE BUT WEALTHY OLD MAID DRIVES IN FOR SERVICE
SERVICE DRIVE IN
THERE IS A WILD SCRAMBLE AMONG THE SERVICE MEN TO BE ABSENT OR OTHERWISE ENGAGED
STOCK ROOM
PARTS
TO OFFICE
JIGGERS! THE OLD MAID!
IF YOU GET CAUGHT AND HAVE TO LISTEN TO HER TALE OF WOE, IT SOMETIMES WORKS TO TRY A NEW TACK
WORST ACTING MACHINE I EVER RODE IN! POSITIVELY!
OH! MISS CAUSTIC! IT CAN'T BE AS BAD AS THAT
SO YOU ASSUME YOUR MOST GRACIOUS AIR AS YOU CLIMB IN BESIDE HER AND ASK HER TO TELL YOU ALL ABOUT IT.
YOU SUGGEST THAT SHE TAKE YOU FOR A LITTLE SPIN DOWN TO THE PARK AND BACK SO YOU CAN LISTEN TO THE ENGINE
NOW YOU DRIVE JUST AS IF I WERE NOT HERE
YOU SLIP HER A FEW COMPLIMENTS ON HER RAPID IMPROVEMENT IN DRIVING AND SHE BEGINS TO FEEL BETTER
BEFORE SHE HAS GONE A BLOCK YOU FIND THAT SHE HAS HER CONTROLS ALL MIXED—CHOKE CLOSED—THROTTLE WIDE—SPARK RETARDED— EVERYTHING WRONG
YOU CALL HER, "MY DEAR GIRL" IN A FATHERLY SORT OF WAY WHILE YOU ARE EXPLAINING—(THOUGH SHE IS OLD ENOUGH TO BE YOUR MOTHER)
YOU SET HER RIGHT WITHOUT CRITICISM AND THROUGH YOUR SUGGESTIONS SHE GETS THE MOTOR PURRING LIKE A KITTEN. YOU FIND HER VERY GOOD COMPANY TOO WHEN GOOD NATURED.
YOU THANK HER FOR THE RIDE AND TELL HER TO COME AROUND IMMEDIATELY AND ASK FOR YOU IF ANYTHING ELSE GOES WRONG
AND THEN, WHEN SHE DRIVES AWAY BELIEVING IN YOU AND THE CAR,
GEE! DON'T YOU FEEL CHESTY?
WOW!!
TOM WILDER



Where Are You Going to Put the Elevator?

Much Valuable Space Often Is Wasted Because of Lack of Foresight in Placing Lifts—Some Representative Layouts With Suggestions

By TOM WILDER

THE placing of an elevator is an item in building layout that seldom receives as much attention as it should. The architect often is ignorant of garage practices and usually places it where it will best fit the construction or the interior arrangement as he sees it without much reference to its approachability when the building is full of cars. He usually imagines the building empty instead of crowded with cars and makes the elevator approach very simple but impractical.

One builder we have in mind had a wonderful idea—he put the elevator shaft in the center of the building so that it could be approached from either side. It was wonderfully convenient but killed the usefulness of the whole center of the building—a space about 50 ft. square or as large as some small town garages. The spaces at the sides of the elevator were not large enough for car storage and one of them at least must be kept open for a passage from front to back of the building.

Wasted Storage Space

In large buildings there seldom is any trouble if judgment is used, but in the smaller ones of 50 ft. width or slightly more or less, the greatest care must be used to avoid either making the elevator awkward to approach and leave or kill more floor space than the size of the building would warrant. In the small building the placement resolves itself into a compromise between convenience and loss of storage space.

As an example of this the elevator at A is probably the most convenient of the group but it kills sufficient space at the sides to store 6 cars. B, on the other hand, occupies space enough for but 2 cars but projects into the aisle so far that even short cars would have trouble getting on it. The only way B can be used is by keeping the opposite space free which would raise its toll of storage space up to 5 cars.

When there is a side entrance into the building the poor arrangement B, becomes an extremely good arrangement B1. Here the loss of two or three extra car spaces may be charged to the side entrance which is worth the expense and the elevator gets off with the loss of only 2 car spaces.

Arrangement D, just back of the sales and office department is an extremely good as well as convenient arrangement but, of course, would be the same as B with a center entrance. With the side entrance, however, a car from outside can drive directly onto the elevator and one from the inside would have no difficulty in driving into the entrance aisle and then backing on.

C is a poor arrangement being worse than A because it uses 6 car spaces the same as A, but in A the spaces at each side of the elevator may be utilized as special shops or something while in arrangement C there is nothing left but aisle space.

Arrangement F, while an unusual scheme, would work out very well in certain cases. It uses only 4 car spaces, can be entered from inside or from the alley and is generally convenient to enter and leave. Beside these advantages the space behind can be used for storage of oil or other commodity.

Arrangement E does not fall in the same group with the others, it being a suggestion for placing the elevator between two aisles in the center of a building 100 ft. wide or thereabouts.

Stearns Develops a Six-Cylinder Knight Engine

THE F. B. Stearns Co., Cleveland, which for seven years has been manufacturing a four cylinder Stearns-Knight motor car, has just announced for publication the specifications of a new six cylinder Knight engine that is to go into a new series of Stearns cars.

The company already has supplied all of its regular dealers with the new models and is going after new ones as the number in the past has been limited. The company will continue to make the four cylinder car. The six cylinder models and prices are: roadster and four or five passenger touring $2700; seven passenger touring $2850; coupe, $3350; coupe brougham, $3500, and sedan $3700.

The specifications follow:

MOTOR—Six cylinder, bore 3⅜ in., stroke 5 in. Stearns-Sleeve-Type valves.

LUBRICATION—Combined force feed and splash system, with gear-driven oil pump.

ELECTRIC EQUIPMENT—Two unit, 12-volt starting and lighting system. 12-volt battery ignition system.

COOLING—Water circulated by centrifugal water pump through cellular type radiator.

CLUTCH—Multiple dry disk.

TRANSMISSION—Three speeds forward, one reverse. Direct drive on third speed.

CONTROL—Gear shift and emergency brake lever in center. Steering gear, brake and clutch and accelerator pedals on left-hand side.

AXLES—Front: I-beam section steel forging with ball thrust bearings on steering knuckle and taper roller bearings in hubs. Rear: pressed steel housing with forged steel hubs keyed direct to axle shafts.

WHEELS — WOOD — Artillery type, equipped with Firestone straight side demountable rims.

WHEELBASE—130 in. TREAD—56 in.

TIRES—34x4½ cord, rib tread front; safety tread rear.

SPRINGS—Front: semi-elliptic, 2½ in. wide by 45 in. long. Rear: Cantilever, 2½ in. wide by 50 in. long.

GASOLINE TANK—With gage. Held at rear of chassis. Capacity, 24 gallons. Vacuum feed system.

LAMPS, TOOLS, EQUIPMENT, ETC.—Two 12-volt double bulb head lights. One 12-volt single bulb tail light. One 12-volt single bulb dash light with switch attached on cowl lights.

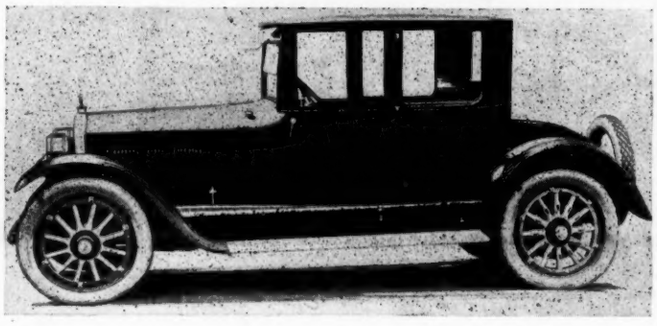
All cars are supplied with suitable mounted ignition and lighting switches, fuse box, ammeter, speedometer, tire carrier, number brackets, together with complete tool equipment, starting crank, pump, etc.

TOP—All tops supplied with door opening curtains and plate glass window in rear curtain. Tops are built of selected black rain-proof material suitably lined and supported.

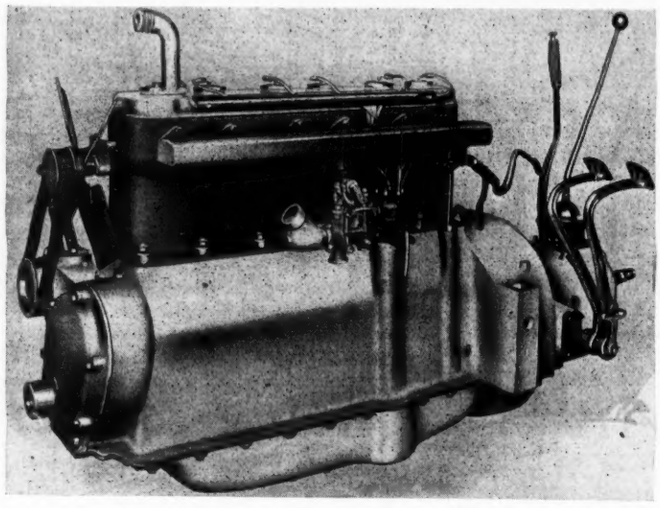
VENTILATOR—In cowl on all models operated from dash.

WINDSHIELD—All open bodies equipped with two-piece plate glass rain vision and ventilating type.

Coupe brougham and sedan equipped with sun shade and a clear vision windshield which eliminates the usual "blind spot" caused by the heavy front door pillar. All other bodies equipped with two-piece plate glass ventilating type.



Four passenger coupe of the new Stearns series Price, $3350



New Stearns-Knight six-cylinder engine, which will be used in the new series of Stearns cars

Reed Inside Micrometer and Height Gage Attachments

REED SMALL TOOL WORKS, Worcester, Mass., has recently developed an inside micrometer with a lower range than its former model.

This micrometer, graduated to read to thousandths of inches, has the usual half-inch run of spindle with a measuring range from 2 in. to 32 in. It retains the usual Reed regulation diameter of barrel, spindle and thimble. The rods, fitted with hardened tool steel anvils adjustable for wear are interchangeable on the threaded stud at end of micrometer head and can be used in combinations. A detachable handle is furnished and so arranged that the micrometer can be used for right or left-handed work.

The standard set, packed in a pocket-size case, consists of the micrometer head, an adjusting wrench, five rods and half-inch spacer, the capacity afforded being 2 in. to 7 in. When five additional 5 in. spacers are used the maximum range of 32 in. is secured. Thus the tool is capable of gaging the smallest automobile cylinder and will take care of the larger measurements in shop use.

REED HEIGHT GAGE AND ALIGNMENT ATTACHMENT NO. 6

The inside micrometer can be quickly transformed into a height gage by use of the height gage attachment. By attaching a rod of proper length to the micrometer any desired range from 3 in. to 32 in. can be obtained. The rod is inserted downward through the steel case-hardened base until the anvil finds the surface from which measurement is to be taken. A quick clamping knuckle nut, easily operated by the fingers, firmly holds the measuring rod in a perpendicular position. Such a tool is useful in obtaining the height of projections from plane surfaces, the location of bushings in jigs, etc. The V-shaped groove in the bottom of the base adopts the tool for use in cylindrical work,

measuring distances between shafts, for alignment purposes, etc.

The cut pictures the combination of height gage alignment attachment with the inside micrometer, showing how a reliable height gage is simply obtained, to serve where the purchase of a much more expensive tool would otherwise be required.

By inserting a .250 in. drill rod in the base and attaching any standard indicator, a surface gage is in readiness for use in straightening shafts or for checking variance in distance between surfaces. A surface gage scriber can be easily clamped to the rod, forming another very handy tool.

REED HEIGHT GAGE ROUND BASE ATTACHMENT NO. 7

This differs from the height gage-alignment attachment No. 6 in construction and is intended chiefly for height gage purposes. The upper end of support, vertically split at right angles, is adjusted to afford a sliding friction as the rod is inserted and will tend to prevent side-play should wear take place from constant use. It also holds the base and micrometer measuring rod intact when the tool is lifted from one surface to another.

A Bold "Ask 'Em to Buy" Plan

"S. O. S." might be interpreted to mean "Save Our Students," so far as the S. O. S. Tire Service Co. of Houston, Tex. is concerned, for this company has evolved a method of "Ask 'Em to Buy," which it believes will be a winner. Houston is the site of a large school for young men and, when the last semester was finished, there was a number of students out on the streets looking for jobs which would pay them enough to take care of the next year at school.

The S. O. S. company called in twenty of these men, and, after putting them through two weeks of sales school, gave them credentials to go out on the street in various sections of the city and sell tires and accessories. The schooling was at the company's expense and the men, when they had finished told that every cent they took in above the wholesale price of their products was their very own. Not a penny of profit was to be turned in to the company.

Notices were sent to the newspapers and in this way, publicity of the news variety was obtained. Car owners, anxious to help the young men continue with their schooling, will be glad to buy from them and will remember, too, that the S. O. S. company is contributing its part to the cause.

Ed. M. Allison, vice-president and general manager of the company believes that while at present there may be something of a cash loss in the venture, the return orders which will come as a result of this campaign will more than cover any expense and that as a good will builder, the plan is unbeatable.

He says: "They will always be boosters and whenever a sale is possible, they are not going to forget us."

When school again opens and the men go back, Allison thinks that the bulk of the people sold by them will remain friendly to the S. O. S.

How Dealers Can Help to Outwit the Motor Car Thief

THE following is an excerpt of a report recently submitted by B. W. McCay of the Theft Bureau of the Pacific Coast Auto Underwriters' Conference. The suggestions made are so obvious that they will appeal to dealers generally:

In compliance with a request embodied in a resolution passed by your organization at a recent meeting in San Jose, I am submitting herewith a few arguments in behalf of the plan whereby the members of your Association are requested to place upon all automobiles handled by them a special mark of identification which could be referred to in case the car is stolen and which would assist in establishing the identity of the machine in case the thieves remove the manufacturer's identifying numbers.

The up-to-date automobile thief makes it his business to become familiar with the manner and the place in which the numbers are placed by the manufacturer of any particular machine. As soon as the car is stolen the thief removes these numbers. After the removal of the original numbers placed on the machine by the manufacturer, the thief substitutes others of his own. On account of this practice of thieves we have under investigation at the present time on the Pacific Coast about 200 stolen automobiles which we are unable to identify.

It is obviously a matter of impossibility for a thief, regardless of how active, to find out from every dealer the place in which that dealer puts his mark of identification and for this reason if all dealers in selling cars would stamp upon the machine in some place known to themselves, a particular number, the thief would undoubtedly miss this number when trying to conceal the identity of the machine he has stolen.

In a recent case in Portland, Oregon, wherein investigators of our Bureau rounded up a gang of automobile thieves, who had stolen some fifty cars, we obtained possession of about a dozen machines which we were unable to identify as all the original manufacturers' numbers had been changed. Knowing where these thieves had been operating, we had investigators visit the various dealers in that territory, asking them if by any chance they placed their own mark of identification upon the cars which they had sold.

Two dealers of Seattle, Washington, they told us that it was their practice to place a certain number upon a certain part of all machines which they sold and by using these numbers we established the identity of six of the remaining twelve machines which we had heretofore been unable to identify.

In this connection it is worthy of notice that four of the six machines which we identified in this manner were uninsured and the service which the dealers who sold these cars rendered to the parties to whom they sold them was of inestimable value, as without the dealer having placed these numbers upon those cars, the owners thereof would have been unable to have recovered them.

In the case of an automobile thief recently convicted in Los Angeles, we found by careful check of his activities that he had disposed of some 30 Buick automobiles, all of which we found with altered numbers. We are convinced that practically all of these machines were stolen in and around Los Angeles and if the Buick dealer in that territory had made a practice of placing upon the cars which he sold his own particular mark of identification we undoubtedly could have returned all of these machines to their original owners but unfortunately this not being the case we have now about 25 Buick automobiles under observation in that territory which we have been unable to identify.

In submitting this proposition to your members you will undoubtedly receive a considerable number of communications setting forth some objections and upon receipt of these I would be glad to assist you in replying to any such objection. The theft of automobiles has grown to such proportion that it is only by enlisting the active co-operation of all parties interested that we will be enabled to control automobile theft within any reasonable limit.

Gasoline Rail-Cars Save $14,000 Per Year

The officials of the Union Transportation Co. of New Jersey estimate that they will have nearly $14,000 annually through the substitution of motor rail car equipment for a steam locomotive and railroad cars.

Erie Official Sees Aid in Trucks

T. C. Powell, vice-president of the Erie Railroad, remarked in a recent address that "The railroads must be relieved of the unprofitable short-haul and terminal traffic and they look to the motor truck, including the farm motor truck, to bring this about."

WHAT the DEALER MUST KNOW ABOUT TRACTORS

Selling the Idea of Power Farming Important, But the Salesman Must Also Be Able to Intelligently Discuss the Mechanical Details of Operation and Maintenance

By E. A. WHITE

THE purchasers of tractors, whether for agricultural or industrial purposes, are becoming more and more "tractor wise," which means that the man who is selling must be prepared to meet a wide variety of mental reservations and questions.

The tractor industry has been accused more than once of devoting too much attention to mechanical details and too little to putting over the fundamental ideas of power farming and the advantages of the use of the tractor in industry. In this connection it is frequently charged that the purchaser is not interested in the details of construction and that to delve into the intricacies of mechanics only confuses the prospect and diverts attention from the main issue, performance.

There is undoubtedly much truth in this contention, but it must not be forgotten that the salesman meets all kinds of customers and some of them are well posted upon the details of tractor design, while others have a natural inclination to learn the whys and wherefores of any piece of machinery.

The Well-Informed Salesman

The important thing from the salesman's standpoint is to be able to meet any customer upon common ground, to present a convincing appeal. So, if the prospect is interested in the details of construction, it is well for the salesman to be able to go to the bottom of this subject. It is simply a case of being prepared to sell in a manner which appeals to the customer, and never forget that the man who is interested in the mechanical features of the machine is apt to be a live prospect and a successful operator.

It is granted that from a national standpoint it may be desirable for the manufacturer to pay more attention to selling the big idea of tractor uses, but the salesman who is moving the goods from the showroom to the field has to meet prospects as he finds them. These undoubtedly have been influenced by advertising campaigns and other forms of publicity, but there is no telling what may have been the individual reaction from these appeals. It is this varied situation which the salesman is compelled to meet.

In addition to the sales value of a thorough knowledge of the details of construction and design, the dealer carries more or less responsibility for the education of his customers, which is of especial importance in the tractor field. There is no doubt that the introduction of power farming has been retarded by a lack of knowledge of the construction and operation of the tractor. If the user knows "why" he is more likely to know "how and when."

Tractor Operator a Factor of Importance

Knowledge properly applied is power, and it is well to remember that the size of the engine is not the only factor to consider when it comes to getting power from the rear end or belt pulley of the tractor. What the operator has under his hat is also a factor of importance. In the majority of cases there is ample opportunity for the dealer or his salesman to slip some constructive and pertinent information under this hat, even though it is necessary to administer the dose under the influence of an opiate of good humor and diplomacy. The operator who knows his tractor stands a much better chance of making a success than the man who takes construction for granted or regards it as something of a mystery.

In order to impart the information which the purchaser may want to know, or should know, it is not necessary for the salesman to be an engineer or even to have a technical education. Just good old common sense may have a much higher value than technical education in such a case. It is entirely possible to explain details of construction, design and operation in a simple, straightforward manner which can be understood by the uninitiated in technical lore. In fact, in the majority of cases, this is necessary if the message is to be put across. Be simple but be thorough is a perfectly safe course of procedure in this case.

Following Trend in Design

With the changes which are taking place in tractor design, especially as regards refinements, it is desirable for the salesman to be thoroughly posted as to the trend in this field. From a sales standpoint the prospective customer is often more interested in the reasons for changes in design than the changes themselves. For example, if it is lighter weight per horsepower, it can be explained that improved traction equipment and more efficient distribution of weight enables the tractor to give the desired drawbar pull with reduced weight. When it is fuel economy, there is a reason for this result. It may be the design of the carbureter, intake manifold or the engine which brings greater fuel economy. For many customers it is much more convincing to explain the reasons for fuel economy than to rest the case on the bare assertion of the fact. To do this convincingly requires a knowledge of the details of construction. In other cases it may be that a change has been made to effect an economy in manufacture, thereby reducing the cost to the user.

Lower Prices Because of Production Efficiency

Price reduction has an especial appeal to the farmer under any conditions, and especially so at the present time. Often it can also be shown that these economies in manufacture have resulted in improved construction or operating qualities which further enhances the appeal. Under present conditions the whole industry will gain in popular opinion by having the salesman take some pains to explain the economies which are being effected in production. It convinces the user that the manufacturer is doing everything possible to meet the situation in a constructive manner. It breaks down the psychological barrage and creates better understanding all around.

It is always a good plan to explain the reasons for certain forms of construction. It may be the placing of the engine crosswise or parallel with respect to the frame. Whichever type may be under consideration, the designer had a reason for his choice and this reason is of interest to the prospect who shows a tendency to delve into mechanical details.

Not long ago one of the largest tractor manufacturers sent

a corps of men from the home office over the field explaining the advantages of certain forms of construction and other matters to the travelers from the various branches. These men came back surprised at the lack of mechanical knowledge on the part of the company's travelers. Notwithstanding the belief in some quarters that mechanical construction has been worked to death as a sales argument, the above incident furnishes ample proof that there is still room for work in this field.

Schools on Construction

Some companies consider this phase of tractor selling so important that they conduct schools for dealers and travelers where the subject of construction and design occupies a prominent place in the curriculum.

How this question of a knowledge of design, especially as related to operation, affects the tractor business was well illustrated by an incident which occurred the other day at a branch house when a dealer brought in a cracked cylinder head with claims for adjustment.

After this matter had been adjusted with satisfaction to the dealer, the manager explained that it was surprising how many operators will have an engine heat up and then remember that the water may be low. When cold water is applied to the heated head it may crack.

If the construction of the cylinder head has been explained to the owner, and the part which it plays in cooling, it is a safe assumption that this experience will not be repeated. It is not enough to say this was entirely the operator's fault, which it was. The constructive way to meet it is to take reasonable educational steps to prevent it. This involves some explanation of the details of construction as a basis for making it understood why certain things should or should not be done.

Power Transmission Interesting

It is a good plan in many cases to explain to the prospect or customer how the power is transmitted from the engine to wheels, taking up the function and construction of the clutch and explaining fully how different rates of travel are secured by the the gear shift and other mechanism. The method of getting power to the belt pulley is also important. In covering these points try to get over the reasons for certain forms of construction, as this always stimulates interest on the part of the owner or operator.

Lubrication is especially important. The system should be gone over in detail and complete instruction given on this point. The reasons for the use of different kinds of lubricants in different places may well be explained, for again if the man knows why, he is much more likely to remember to give attention to this work at regular intervals. Many farmers, yes, the majority, are notorious for their neglect of the lubrication of machinery of all kinds, and perhaps they are not so much different than the rest of us in this respect, either.

The construction of the valves and valve seats merits attention if handled in such a manner as to show the relation between proper setting, compression and operation. The firing order of the cylinders and the importance of the proper timing of the spark also have a direct relation to efficient operation. It is an excellent practice to dwell upon those phases of construction which have a more or less direct relation to efficient operation.

Steels and Alloys Mean Much

Many think that the materials used in construction are not of primary interest to the purchaser, yet there is sales value in this subject if it is properly handled. Many prospects cannot help but be impressed with the fact that the use of alloy or heat-treated steels at critical points, from a wearing standpoint, are important. The fact that these steels are stronger, tougher, more resistant to wear and the effects of vibration tells a constructive sales story.

There is valuable sales material in design and construction if it is used in the proper manner. However, it is difficult for most prospects to get this from pictures and diagrams. The most effective way to use it is to have pieces of equipment and material and cutout models, in the place of business, where these points can be explained in a manner that can be seen. **The eye is often more susceptible to a sales appeal than the ear. Some investigations which have been conducted on this subject reveal that the appeal to the eye is many times stronger than to the ear.** Advantage should be taken of this fact. In fact, the most efficient manner to make the construction appeal effective is to use both the eye and ear appeal, but do not make sight secondary to hearing.

The tractor dealer or his salesman should always know his tractor well enough to properly train the operator sufficiently to enable him to use the machine effectually and to avoid those losses due to ignorance.

TWO IMMENSE SERVICE STATIONS

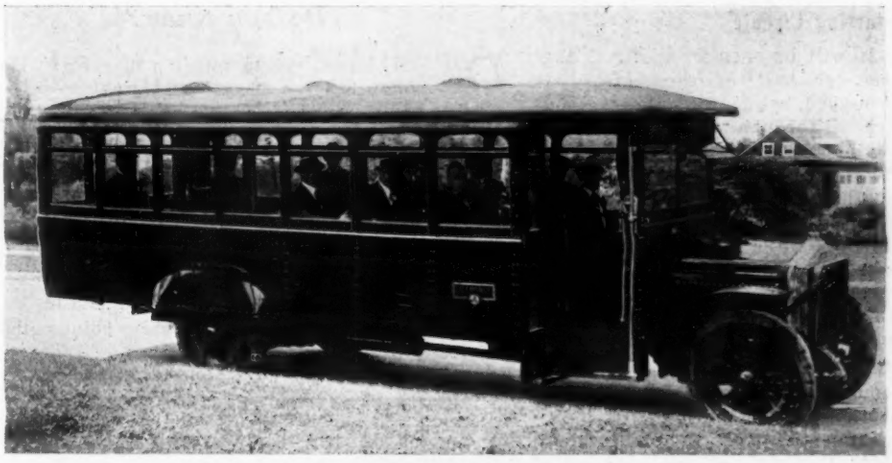
BROOKLYN, July 11—Work has been started on the erection of a new Studebaker service station in Brooklyn on property purchased by the Studebaker Corporation of America at Bergen and Dean streets. The expenditure, including the cost of the land, will amount to about $500,000. It is expected that the building will be ready for occupancy about Oct. 1.

CLEVELAND, O., July 11—Work will be started immediately by the Studebaker Corp. of America on the erection of a new service station on East 25th Street near Payne Avenue. The investment will amount to about $250,000. It is expected that the building will be ready for occupancy about Oct. 1.

PREMOCAR EXPANSION PLANS

BIRMINGHAM, Ala., July 10—Production of the Preston Motors Corporation here is to be speeded up to 15 Premocars daily within the next 60 days, according to plans being made following announcement of the purchase of $300,000 in bonds of the Preston corporation and the underwriting of $8,000,000 worth of stock by Frank J. Ryan & Co., Ltd., of Tampa, Fla. This announcement is made by Frank J. Ryan, president of the Florida concern, who has been in Birmingham for several days working on the deal.

Offices are to be opened immediately in Kansas, New England, Tennessee and Florida, according to Ryan, who states that other plans for pushing the Premocar are in process of being worked out.



Four Selden Motor Buses Put in Service Recently

Accommodations for 29 passengers are provided in the bus body shown above which was made by the Kuhlman Co., Cleveland, and mounted on the Selden motor bus type chassis. Four of these buses operate daily between Rochester and Pittsford, N. Y.

This List Will Be a Time Saver When an Electrical Problem Comes Up on Any of the Cars Described

The following electrical systems have been described in previous issues:

Car	System	Issue
1921 Ford	Ford	Nov. 10, 1921
1921 Dodge	North East	Dec. 1, 1921
1921 Buick	Delco	Dec. 15, 1921
1921 Overland	Auto-Lite	Dec. 29, 1921
1921 Studebaker	Wagner and Remy	Feb. 16, 1922
1921 Chevrolet FB & 4-90	Auto-Lite and Remy	Mar. 9, 1922
Maxwell 1920, '21, '22	Simms-Huff & Auto-Lite	Mar. 23, 1922
1921 Oldsmobile Six, 37-A and B 1921 Oakland, 34-C	Remy	Apr. 13, 1922
1921 Oldsmobile, 4 & 8 Cyls.	Auto-Lite and Remy	Apr. 27, 1922
1921 Hudson	Delco	May 18, 1922
1921 Reo and Speed Wagon F	North East	June 8, 1922
1920, 1921 Chalmers	Auto-Lite and Remy	June 29, 1922

American Bosch Electrical System on 1921 *and* 1922 Chandler Cars

This Article Gives Methods of Locating Magneto Trouble, These Instructions Being Applicable to Any High Tension Magneto With Rotating Armature

ARTICLE THIRTEEN of a Series by A. H. PACKER

THE electrical system on the 1921 and 1922 Chandler cars employs the same electrical units, there being but slight difference in the wiring and minor accessories used. In the 1922 car, an ammeter has been added which was not used in the 1921 model, also in addition to the large and small bulbs in the headlights, side lights have been added, which means that the switch has one more terminal and the fuse box one more fuse, on the 1922 car. Aside from these details, the layouts are identical. The detail explanation will cover specifically Fig. 1, which covers the 1921 model, but by referring to Fig. 2, which shows the 1922 wiring, the system of that car can also be understood.

Starting Circuit

It will be seen from Fig. 1 that one terminal of the battery is grounded, while the other is connected through a heavy cable to the starting switch. From the other terminal of the starter switch another heavy cable goes to the starting motor, so that when the starter switch is pressed current will go to the motor. The circuits through the motor can best be understood by referring to Fig. 3, which shows the motor as if the commutator end bracket had been removed but the brushes and connections left in place.

From the live starter terminal the current divides, part going through the two field coils at the left, while the rest goes through the two coils at the right. From the left set of coils connection is made to the upper left-hand brush, while the other field circuit connects to the lower right-hand brush. The circuit through the armature is completed by the two ground brushes, which are shown connected to the frame of the starter.

Locating Starter Trouble

To find out whether the cause of starter trouble is really in the motor itself or in the battery or wiring, it is helpful to turn on the headlights and observe their action while the starter button is being held down.

LIGHTS GOING OUT under these conditions usually shows corroded connections where the heavy cable terminals connect to the battery posts, another possible location for trouble being the battery ground connection at the frame of the car. One way of checking such trouble is to remove and clean up all three of these likely places, but this involves unnecessary work. To find the connection that is the real cause of the trouble, it is sometimes helpful to hold the starter button down for a few seconds and then feel of the various connections, as the one that is bad will begin to get hot with the current going through it.

A more accurate way to locate high resistance is to use a voltmeter connected across the suspected contact while the starter button is held down. With a good connection, there will be either no movement of the voltmeter needle or else a barely perceptible movement, but if the contact is badly corroded, the meter may show a reading of a volt or two. The remedy is of course to remove and sandpaper the affected surfaces.

LIGHTS STAYING THE SAME shows an open circuit, which can be found most easily with a six-volt test lamp, connected one side to the frame of the car and the other lead to various parts of the starter circuit. For example, the free lead from the test light should be touched at the live terminal of the battery and the lamp should light. With the starter button held down, it should then be touched to the battery side of the starter switch, then to the motor side, and finally at the motor terminal itself. For instance, if the lamp should light at one side of the switch and not at the other, it would show the open to be in the switch, so that we conclude that the trouble is in between the last place where the lamp would light and the first place where it fails to do so. If the lamp lights all the way up to the starter terminal, it shows an open circuit in the motor itself, which is usually due to the brushes being worn down from long service. The remedy is to remove the motor,

Do You Know?

DO YOU know how to repair a magneto? Do you know how to test a magneto and be able to say exactly what is wrong with it? Do you know that the mechanic that does not know the tricks in magneto work will be likely to make four mistakes in overhauling, any one of which will make the magneto worse off than it was before, and that there are two of these mistakes, either one of which will prevent the magneto from working at all?

This article covers not only the electrical apparatus on this car, but, as it is magneto equipped, will give an explanation of magneto trouble shooting and testing.

Here is your chance to pick up some pointers that are hard to get.

turn down the commutator and install a new set of brushes.

LIGHTS GETTING DIM when the starting switch is operated shows either that the battery is low or that the starter is drawing an abnormally heavy current due either to mechanical or electrical trouble. To check the battery, a hydrometer should be used, a gravity reading of 1280 showing full charge, while 1150 shows discharge. These readings are reliable only when one is sure that no heavy acid or battery dopes have been added, so that it is well to also check the battery condition with a low reading voltmeter, readings being taken on each cell while current is flowing to the starting motor. Cell readings of about 2 volts show battery to be in good shape, while readings of about 1.6 volts at each cell show battery to be discharged. If any cell is shorted due to buckled plates, rotted separators or both, the reading will be very low or may be even in the reverse direction from what it should be. If the starter has either a mechanical bind or an electrical short, it may draw such a heavy current as to hold the cell voltages down where it appears that the cells are discharged. It is therefore also advisable to check the current being drawn by disconnecting one of the leads from the battery and connecting a high reading ammeter in series, so as to read the starter curent. One hundred fifty amperes is usually enough to crank the average engine, unless it is unusually stiff, so that if the current is much in excess of 200 amperes it is likely that there is trouble in the motor, and it should be removed for investigation. THE STARTER CAN BE REMOVED by taking out the two cap screws in the flange of the bendix housing, these being accessible from under the car; also the two cap screws in the web of the engine should be removed. These go into the frame of the starter itself, supporting it from the upper side.

STARTING MOTOR TROUBLE is usually located by inspection, although there are a few tests that should be made when the starter is taken apart. Test for ground can be made by lifting the grounded brushes from the commutator and then using a 110-volt test line with lamp in series with one of the test leads. One test point can now be connected to the frame of the starter and the other touched to the terminal or brushes. The grounded brushes, of course, will cause the lamp to light, but if the others do, it shows a ground in either the brushes or field coils. The next step would be to disconnect the brushes from the fields to determine which is at fault. Then if the location is not definite, a six-volt battery can be connected to the frame and the grounded circuit, and the heavy current flowing will soon send up a curl of smoke which will indicate the location of the trouble. The grounded coil can then be removed and tape or fish paper used to insulate it.

THE STARTER ROTATION is clockwise from the driving end on which the bendix drive is mounted, so that from the commutator end shown in Fig. 3 it is indicated as counterclockwise. When the starter is tested after being repaired, it should rotate freely, and when a battery is connected should rapidly attain a very high speed, turning in the clockwise direction from the drive end. Should it by any chance turn the wrong way, it can be easily reversed by grounding the brushes which had been connected to the fields, and connecting the fields to the brushes that had been grounded.

Generator Circuits

The internal circuits of the generator are shown in Fig. 4, there being two main brushes and one third brush. The lower left-hand main brush is grounded, while the other has a lead going to the top of the generator, this lead being connected to a screw in the base of the cutout, when the cutout is mounted in place on the generator. The field circuit is from the third brush through all four coils to the field fuse, and through it to ground, which completes the circuit to the lower left main brush.

THE CUTOUT DETAIL is shown in Fig. 5, the screw at the base being alive from the generator brush. This makes the main frame of the cutout and the core alive. From the core the fine or shunt winding connects to the base of the cutout, which is grounded by the screws that hold it to the machine.

Fig. 1—Wiring Diagram of the 1921 Chandler, American Bosch System

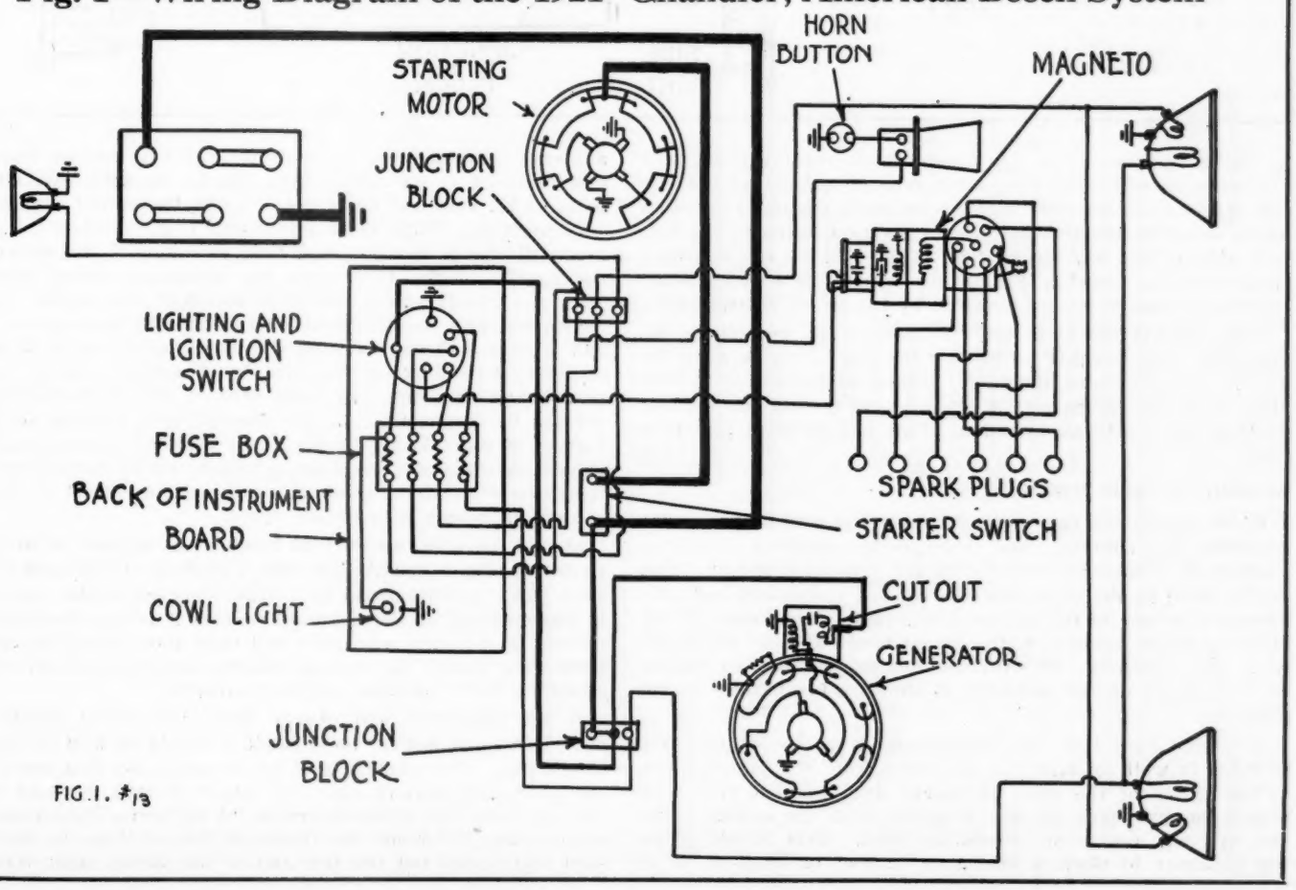
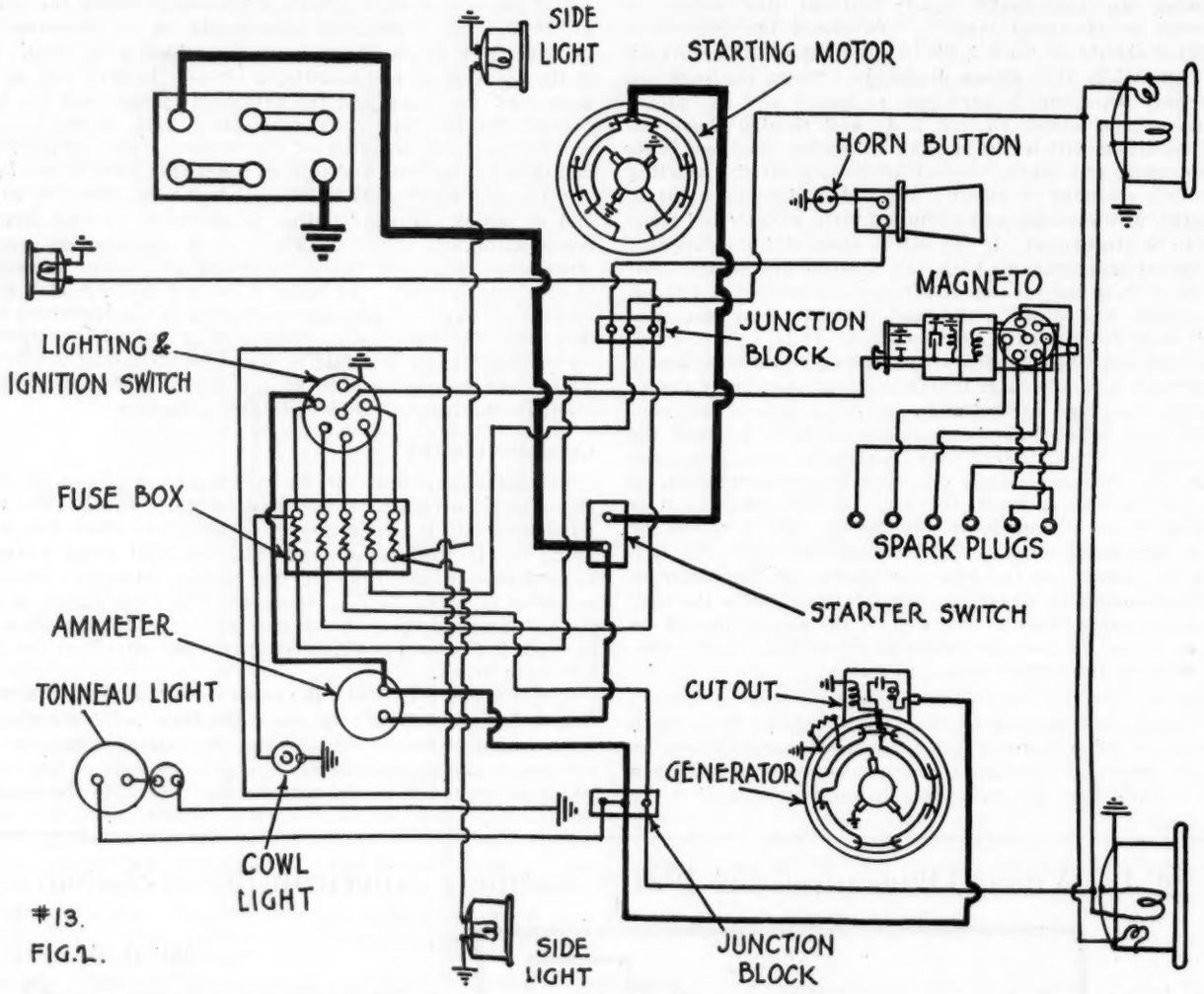


Fig. 2—Wiring Diagram of the 1922 Chandler, American Bosch System



As the generator voltage increases, the current through this fine winding will close the cutout points, completing the circuit through the heavy or series winding to the outer terminal which connects through one of the junction boxes to the battery side of the starter switch. This part of the charging circuit can be seen in Fig. 1, the circuit to battery being completed from the starter switch by the heavy starter cable.

THE FIELD FUSE is for the purpose of protecting the generator from burning up in case the connection between the battery and generator should be broken while the car is running, or in case the battery is removed and the car run without another battery being installed. This should be a 5-ampere fuse.

Generator Trouble Shooting

When the battery runs down frequently it may be due to the generator not charging, and to locate the cause it is well to connect an ammeter in series with the generator circuit. This can be done by disconnecting the wire at the cutout and connecting it to one of the ammeter terminals. Then connect the other ammeter terminal to the cutout terminal from which the wire was removed. If with the engine running no charge current shows on the ammeter, it shows the generator is not charging.

To make sure that the connections from the battery are O. K., it is well to flash the live wire from the junction box to the frame of the car. If sparks are obtained, this wire should be put back on the ammeter and the cutout cover removed and the points closed by hand. This should cause the ammeter to show a discharge current of from 15 to 20 amperes. To check the field circuit, the fuse can be removed and replaced in its clips, slight sparks showing this circuit to be O. K., this test being made while the cutout points are held together. With armature circuit O. K. as shown by the heavy discharge current, and field circuit O. K. as shown by the sparks at the fuse clips, the generator should charge. With the cutout points still held together, the engine should be started, and the discharge current should decrease to zero and become a charge current, the needle going up to 12 or 15 amperes, depending on the third brush setting. If the meter used reads only one way from zero, it will be necessary to reverse the connections as the current goes through its zero value. If there is any doubt as to whether a heavy current shown on the meter is really a charge or discharge current, it can be determined by changing the engine speed as charge current increases with engine speed.

Should the charging current be only one ampere or so at all engine speeds, it usually indicates a shorted or grounded armature. This condition can be further checked if the generator is disconnected at the coupling so that it is free to run as a motor. A defective armature will then show up if the cutout points are closed, the uneven running and jerky action of the ammeter needle showing armature trouble.

If the generator will charge when the cutout points are closed, but will not cut in by itself, it would be well to remove the cutout. This can be done by removing the two screws in the base, and then turning the cutout so that the lead from the generator can be disconnected. A voltmeter should now be used, connected from the frame of the machine to the live lead that comes out the top, and if this shows eight volts or

more at moderate speed, it shows the generator to be O. K., but if very little voltage is obtained, there is probably a poor connection in the field circuit, or the brush surfaces are oily and the brushes oil soaked, or some such condition exists which puts a high resistance in the field circuit, which, while not enough to prevent the machine working when connected to the battery, is just enough to prevent its building up on its own residual magnetism.

If the generator seems to be O. K., as indicated by voltage shown on the meter, the cutout should be tested to see if the shunt winding is open. If battery leads are connected from the frame or base to the screw under the center of the cutout, faint sparks should be seen as the circuit is made and broken. To make a more accurate test, a voltmeter can be connected in series with the fine winding, and if no reading is obtained, the circuit is open.

If the circuit is O. K., the cutout points should close when connection is made to four cells (eight volts) of a 12-volt battery and should not close when connected to six volts. This shows the spring tension to be approximately O. K.

Removing Generator

Removal of the generator is very simple, it being only necessary to remove the cap screws under the mounting bracket, and to disconnect the coupling.

THE FIELD CURRENT should be about 4 amperes when a 6-volt battery is connected from the insulated fuse clip to the third brush, while the MOTORING CURRENT is about 4 or 5 amperes. The reason that the motoring current is about the same as the field current, as above indicated, is that when motoring the field is connected to about 3 volts, while when connected to the battery for test purposes it is hooked up to 6 volts.

ROTATION OF GENERATOR is clockwise from driving or coupling end, or counter clockwise from the commutator end, as shown in the sketch. The output of the generator is regulated by shifting the third brush, which is accessible by removing the commutator cover. Loosening one nut permits shifting this brush, and a special wrench can be obtained for this purpose from American Bosch Service Stations.

Operation of Lights

Current for the lights comes through the heavy starter cable to the starter switch, then through a smaller wire to the junction box at the right of the dash, and from there to the "Bat" terminal of the lighting switch. Current for the cowl light comes directly from this "Bat" terminal, but all the other

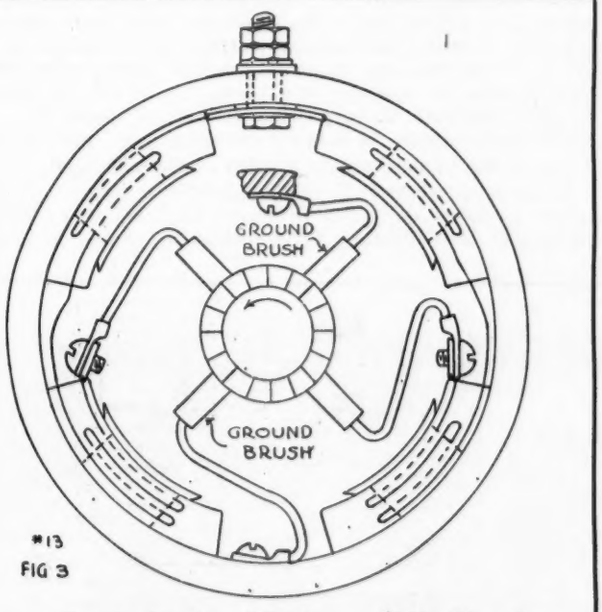


Fig. 3—Bosch Starting Motor on 1921 Chandler—View from Commutator End

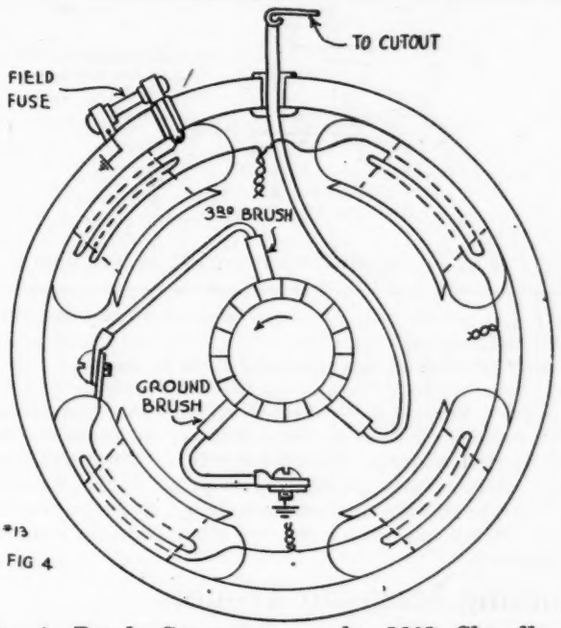


Fig. 4—Bosch Generator on the 1921 Chandler—View from Commutator End

lights and the horn get current through fuses. Current through the upper fuse goes to the horn and horn button to ground. The next fuse handles the tail light current. The third fuse from the top carries current for the small bulbs in the head lamps, while the lower fuse carries the current for the large head lamp bulbs.

Trouble with the lamps can usually be analyzed by studying the circuits shown in the diagram. For example, one head lamp bulb only being out could not be due to a blown fuse, but would be due to a burnt out bulb or a poor contact in the lamp socket or plug, or would be in between the lamp and the junction of the two lamp wires. Both lamps on the large head lamp circuit being out, however, would indicate a possible blown fuse, and when a fuse needs replacing the circuit should first be examined to see if it is grounded. Such a condition may occur due to a wire being cut by the corner of the frame, or it is also possible that stray strands of wire at the lamp socket are touching the sides of the socket. If none of the lights are working, the trouble is probably between the battery and the switch, and if the starter is working, it is in between the starting switch and the lighting switch, or else in the lighting switch itself.

Magneto Operation

Internal circuits of the magneto are shown in Fig. 6. Rotation of the armature generates an alternating current in the primary or heavy winding, one end of which is grounded, while the other end is connected by the same screw that holds the interrupter on to the insulated interrupter contact.

When the interrupter contacts close, the circuit of the primary is completed so that current can flow in it. At the peak of the A. C. current the interrupter points open, and the sudden stopping of the primary current generates a very high voltage in the secondary winding, which is made of very fine wire with many turns. One end of the secondary is grounded through its connection to the primary, while the other end goes out to the brass ring in the collector ring, the sides of which are made of hard rubber or similar material. The high tension current is taken from this ring by means of a brush which by means of a short lead connects to the distributor, from which the current for the sparks goes to the separate plugs in proper order. As the production of the sparks depends on the sudden stopping of the primary current, which in turn is produced by the opening of the interrupter points, it is easy to see that shorting the interrupter would kill the sparks, and this is the action of the ignition switch in the "Off" position.

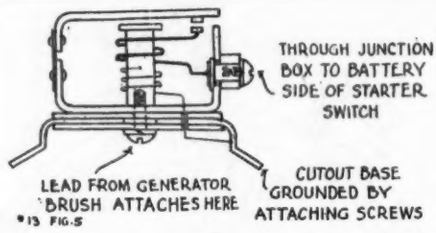

THROUGH JUNCTION BOX TO BATTERY SIDE OF STARTER SWITCH
LEAD FROM GENERATOR BRUSH ATTACHES HERE
CUTOUT BASE GROUNDED BY ATTACHING SCREWS
#13 FIG.5

Fig. 5—Bosch Cutout on 1921 Chandler

In Fig. 1 a wire will be seen connecting from the magneto to the lighting and ignition switch, and the ignition key in the "Off" position makes the connection to the upper terminal which connects to the frame of the car. Sudden stopping of the primary current is facilitated by the use of the condenser in Fig. 6, which is built in the armature and connected across or in parallel with the interrupter points. Return of the secondary current from the frame of the car to the armature is facilitated by the ground brushes shown in Fig. 6, one being in back of the interrupter and the other being in the base of the magneto.

Shooting Magneto Trouble

If the engine will not run and there is gas in the tank, the sparks at the plugs can be checked by removing a wire from one of the plugs and holding it within ⅛ in. or less of the base of the spark plug so as to form a spark gap. The engine should now be cranked either with the starter or by hand to see if a spark jumps this gap.

If no spark is obtained, the wire should be removed from the interrupter, as it is possible that it is grounded, thus shorting the interrupter. If this does not correct the trouble, the interrupter points should be watched while the engine is turned over to see if they make and break properly. To see them clearly, a small mirror is quite helpful. If it seems desirable to get a better look at the points or file them smooth, it can best be done by taking the interrupter off.

TO REMOVE INTERRUPTER take off the interrupter cover and remove the long hex. head screw in the center of the interrupter, and then pull the interrupter off. After the points have been cleaned up, GREAT CARE SHOULD BE USED in replacing the interrupter, as it is absolutely essential to get it on right. Careful examination will show a sort of key made by punching up part of the tapered portion of the interrupter hub which fits in the end of the armature shaft. This must fit into the keyway in the shaft or the magneto will be out of time and will not fire. The trick is to put the interrupter in place and then turn it until the key is felt to drop into the notch or keyway. Then with it held carefully in that position, the long screw should be replaced and tightened. In case of failure to get sparks at the spark plugs, another possibility is in trouble in the high tension brush holder. This should be removed and examined carefully to see if there are any burnt streaks over the surface, as accumulation of carbon dust on the sides of the brush holder sometimes causes the spark to jump over the surface to the frame of the magneto. Then after a few of the sparks have jumped, the surface will be burnt and carbonized so that it makes a very easy path for the sparks and they will no longer jump the plug gaps. If such a condition exists over the surface only, it can be corrected by scraping the surface with a knife to remove the carbonized portion. With this leakage path removed, the brush holder will again be O. K.

Removing Magneto

The inspection above suggested is about all that can be done in checking magneto ignition without removing the magneto from the car. To do so is simple enough, but if an easy job of replacing is desired, the timing should be noted before the magneto is taken off. One simple method is to retard the spark lever on the steering column and turn engine over until the distributor arm is just under the segment connecting to the No. 1 plug and the interrupter points are just ready to open. This is the No. 1 retard firing position. If the magneto is removed and replaced in this position, the retiming job is avoided. Another suggestion is to mark the coupling, but this is not enough by itself, as the distributor arm location must also be noted, for the coupling goes around three times while the distributor turns once|

Four Mistakes Easily Made

Unless the repair man is accustomed to repairing magnetos, there are four mistakes that he may make in doing the overhaul job. In removing and replacing the interrupter, he may forget about the small keyway and get the interrupter out of time with the armature position.

Second, in removing the armature he may break off the ground brush that is in the base of the magneto. This can be avoided by turning the magneto upside down and taking this brush out before any other work is done.

Third, in removing the armature he may neglect to place a keeper across the magnets, so that they will be weaker after the job is done than before.

Fourth, he may get the distributor timed wrong when reassembling the magneto.

Using Keepers

There is room for argument about the exact value of a keeper, but there is not much question but what it does some good. To keep the magnets strong, however, there are several requirements. First, do not try to use a screw driver or file or other small tool as a keeper. It is just as well to use nothing, as the sectional area of the tool is not great enough to do any good. A bar of soft iron should be used that has about the same sectional area as the magnet, say a ⅜ by 1½ in. bar 4 in. long, would do very well. Another mistake is to apply the keeper after the armature has been taken out, whereas it should be applied WHILE the armature is being removed, so that the magnets are not FOR EVEN AN INSTANT without some sort of a keeper. To do this, the magneto bearing brackets at both ends should be removed, so that while the armature is being withdrawn from one end of the magneto the keepers can be applied at the other end.

If the magneto is to have its magnets recharged, as should really be done on every overhaul job, then care with the keepers is not necessary. The recharging should in this case

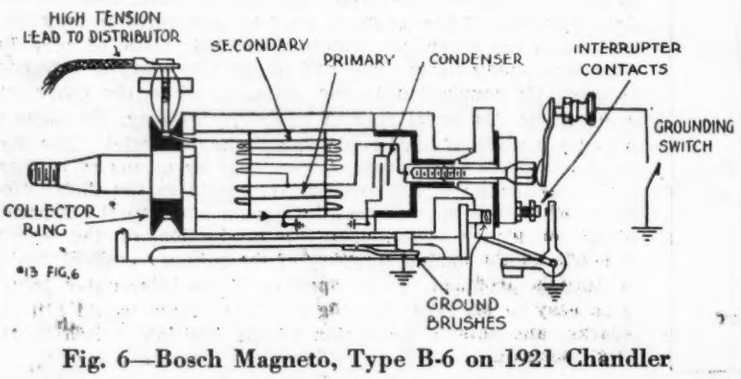


Fig. 6—Bosch Magneto, Type B-6 on 1921 Chandler

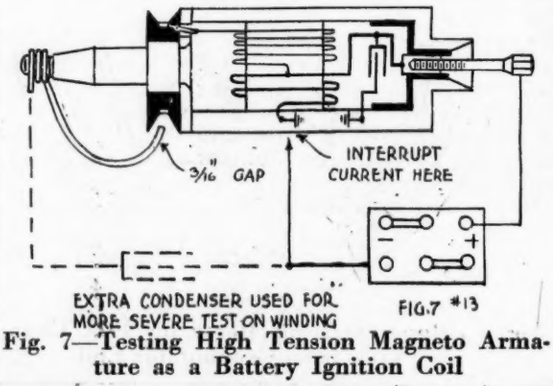


Fig. 7—Testing High Tension Magneto Armature as a Battery Ignition Coil

be done after the magneto is otherwise completed, and keepers should be used in transferring the magnets to the magneto.

Armature Testing

When the magneto has been taken apart, the armature can be tested just as if it were a battery ignition coil, the connections required being shown in Fig. 7. The interrupter has been removed from this armature, but the long screw has been replaced to serve as a terminal for the primary winding. As the other end of the primary is grounded, the end of the shaft serves very well as the other terminal.

In actual service straining of the secondary winding is avoided by the use of a safety gap, which is formed by a sharp point under the distributor arm, which extends down toward a grooved track in the base of the distributor housing.

In testing the armature a similar gap must be provided, or the very test we are using may ruin the armature. The stiff piece of wire shown wound around the shaft and bent over toward the slip ring provides the necessary spark gap, a setting of 3/16 in. being about right. The only other thing to do is to connect one end of a battery to the interrupter screw and scrape a wire from the other battery terminal along the iron sides of the armature, the grooves for the binding cords providing a fairly quick breaking action which, with a good armature, gives good sparks at the improvised gap. Slightly better action can be obtained, however, if a regular interrupter is used where the sketch is marked "Interrupt current here."

In making this test, a good armature will give a spark that can jump the 3/16 in. gap, but it will not have much heat or red color in it. This is due to the fact that the condenser in the armature is not connected across the interrupter that we are using, but is across the primary winding instead. To get better results, a second test can be made with an extra condenser connected as shown by the dotted lines. This second condenser will actually be in parallel with the interrupter we are using, and the spark will now jump more easily and will have more heat or red color to it.

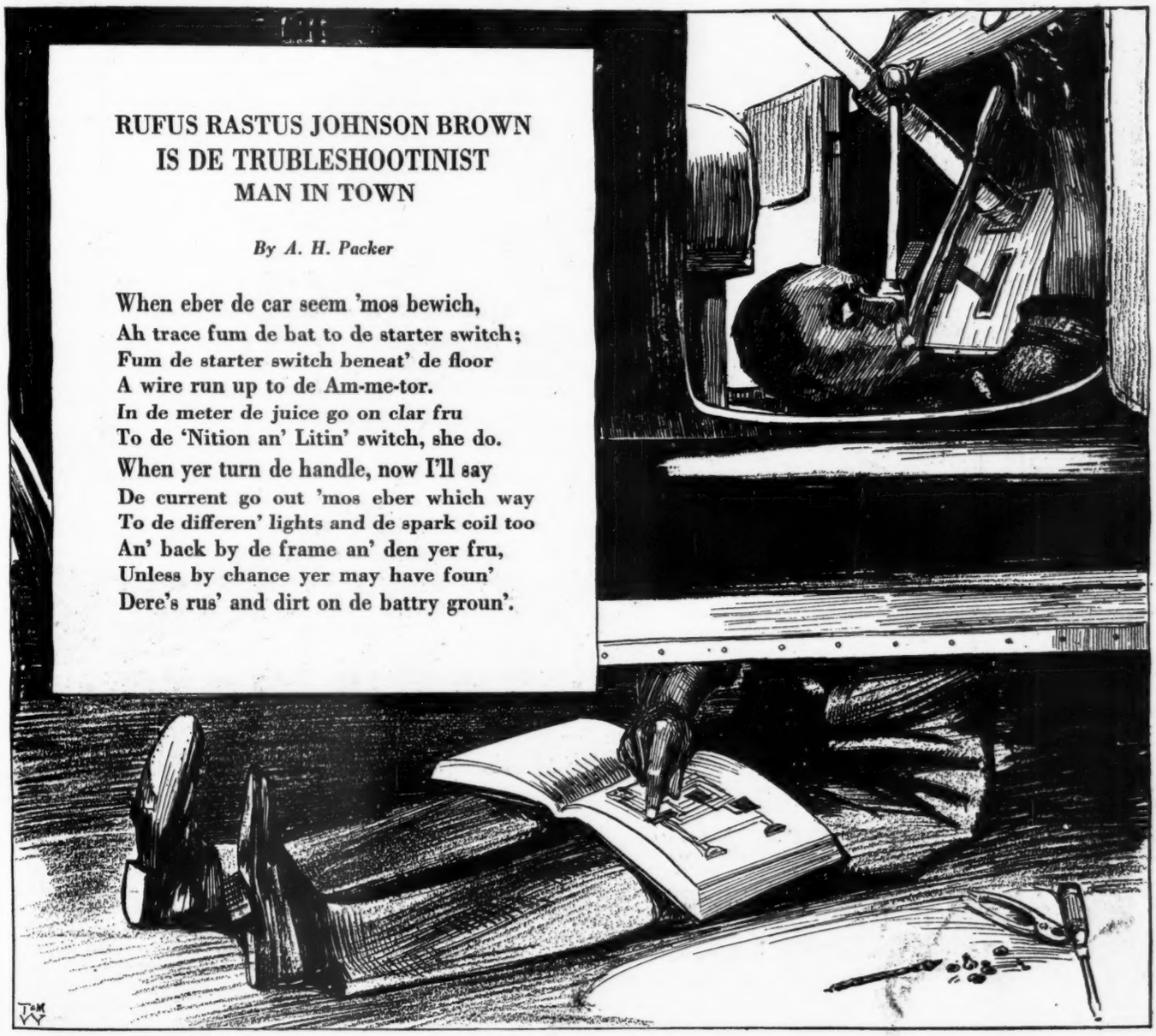
If both tests give poor results, it shows trouble in either the secondary winding or in the condenser in the armature, and in either case it requires that the armature be rebuilt by a competent magneto man, the defective part being replaced.

If the armature tests O. K., there is not much question but what the magneto will work if carefully assembled, this including proper locating of the interrupter, putting the key in the keyway, also careful charging of the magnets, or else careful replacing of the armature at one end of the magneto while the keepers are removed at the other end. The distributor must also be properly timed, the best method being to set the interrupter housing in the advance position (against rotation). The armature should then be turned until the points are just ready to open, and at this instant the distributor brush should just be beginning to make a full contact with one of the segments. It should not have traveled appreciably across a segment nor be nearly ready to go off, or the timing will be wrong in the retard position. In installing on the car, the retard position of the interrupter is again used.

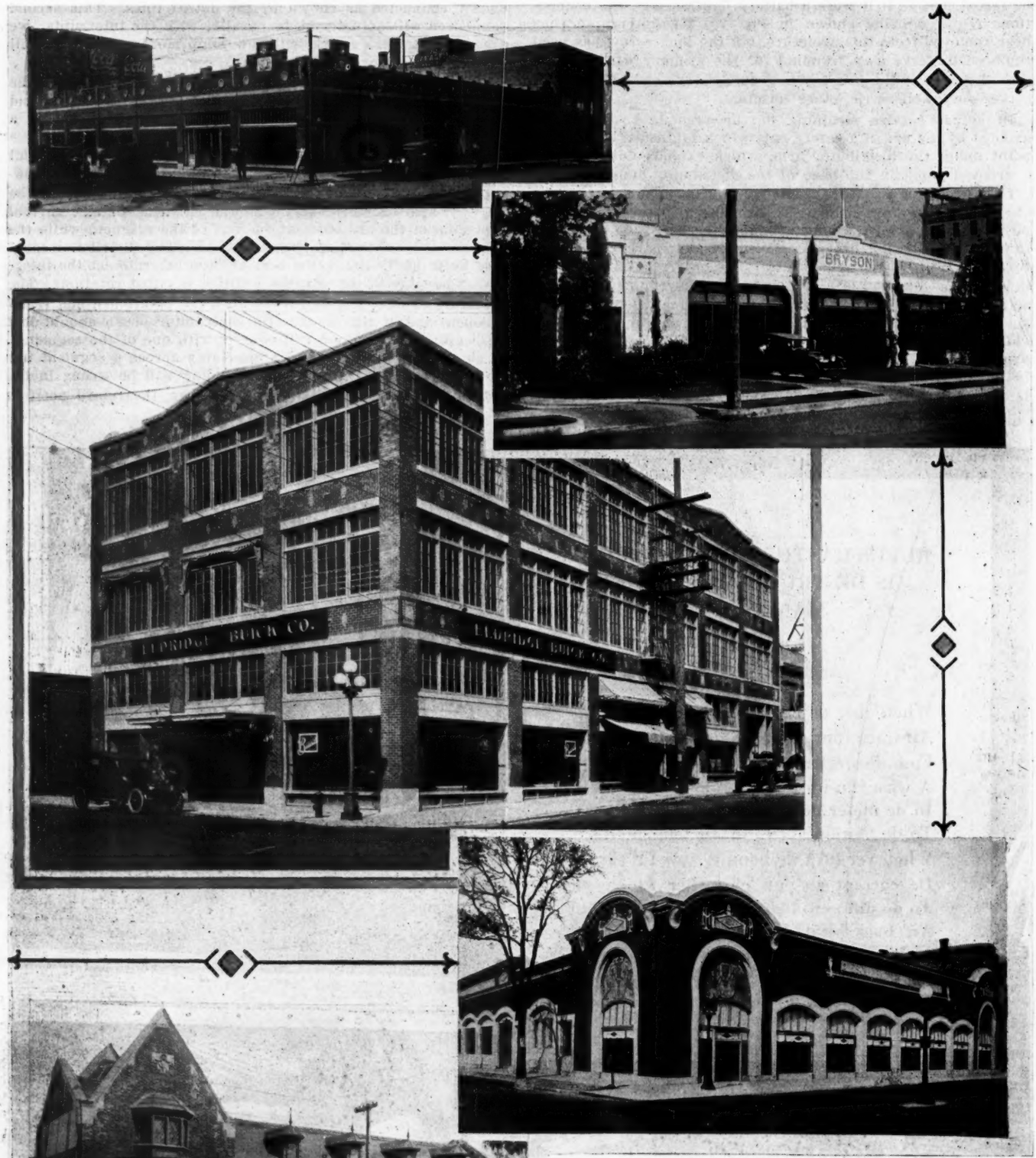
RUFUS RASTUS JOHNSON BROWN IS DE TRUBLESHOOTINIST MAN IN TOWN

By A. H. Packer

When eber de car seem 'mos bewich,
Ah trace fum de bat to de starter switch;
Fum de starter switch beneat' de floor
A wire run up to de Am-me-tor.
In de meter de juice go on clar fru
To de 'Nition an' Litin' switch, she do.
When yer turn de handle, now I'll say
De current go out 'mos eber which way
To de differen' lights and de spark coil too
An' back by de frame an' den yer fru,
Unless by chance yer may have foun'
Dere's rus' and dirt on de battry groun'.



Buildings In Keeping With the Dignity of the Automotive Business



Is a man's character revealed by the clothes he wears? Perhaps not, but the automotive dealer whose establishment appeals directly to the buyer all the way through is the one more likely to "get across" with the character appeal. Buildings such as the ones shown here certainly reveal the character of the products sold and the prospective buyer will more readily become a real buyer, if the outside of the building presents an inviting appearance

Development of Storage Batteries for Use on Motor Cars

How Problems Affecting the Size, Construction and Assembly of This Unit Have Been Solved by the Engineers of This Industry

ABOUT 1907 battery engineers turned their attention to the probable field for storage batteries in connection with gasoline vehicles, the first important step in this field being the development of six and twelve volt incandescent lamps suitable for lighting service and capable of withstanding the constant jarring and bumping to which they are subjected while in service.

The next logical step was the development of an electric generator designed to supply the battery with sufficient current to keep it fully charged and an electric motor with sufficient power to crank the engine.

The first commercial installation of this kind was made on the 1912 Cadillac car, the equipment being manufactured by the Dayton Engineering Laboratories at Dayton, O., and consisted of a motor generator and a 24-volt battery. The battery consisted of twelve cells divided into four sections of three cells each and by means of a two position contact knife switch carried in the battery box, these sections were placed in series for starting, and in parallel for lighting and charging. An ampere hour meter was also used in this installation, it being so arranged that it automatically cut in or out a shunt winding in the generator field, thereby controlling the charging rate to meet the particular state of charge of the battery. This was a rather expensive and complicated apparatus and it very quickly gave way to the simpler 6 and 12 volt starting units.

During the early development of the electric starter numerous voltage systems were used, such as 6, 8, 12, 16, 18, and 24, but they rapidly narrowed down to the 6 and 12 volt systems. The battery required for the 12 volt is heavier and more expensive than that required for the 6 volt system, which is probably responsible for the general tendency toward the lower voltage unit.

Location of Battery in Car

In the application of the starting and lighting motor equipment the last thing given consideration by the automotive engineer was the installation of the battery. The engineer would find that he had an available space of certain dimensions, and it was the problem of the storage battery engineer to design a suitable battery to fit into this space. This naturally resulted in a weird assortment of battery sizes, shapes and assemblies. However, during the late war, a committee composed of engineers from the various battery companies worked out a set of proposed standards to eliminate some of the confusion. These were proposed by the Automotive Electric Association, and subsequently adopted by the Society of Automotive Engineers.

Nine batteries are included in the standardized list of which seven are 6 volt and two are 12 volt batteries.

The two most important features in the life of the storage battery are the positive plate and the separator. It is safe to say that the positive plate, which is the result of a compromise between capacity and life, is gradually improving in quality and performance. It will be found today that the positive plates of the more substantial and successful manufacturers are superior to those of the smaller and shorter lived concerns. It is a relatively simple matter to build a positive plate with large capacity, the necessary information being taken from published books and papers, but it will usually be found that although a battery built on such information has fair capacity it has a relatively short life, or if it has long life it has small capacity. Development along this line has been one of maintaining a high capacity with a gradual increase in life.

The Problem of Separators

The separator constitutes the most difficult problem the storage battery engineer has to deal with.

The present starting and lighting batteries are equipped with four types of separators, these being

Wood;

Wood, combined with a perforated rubber sheet;

Threaded Rubber, and

Celluloid.

The porosity of the separator is a vital factor and affects the voltage of the cell on discharge. This feature is of great importance when it is necessary for the battery to supply the large current required to crank a motor. In general, it can be said that with a given number of separators of a given size, the life is inversely proportional to the voltage of the cell in which those separators are used. That is, if the voltage of the cell is higher, the resistance offered by the separator to the passage of current is lower, its quality is poorer, and, consequently, its life is shorter.

Design of the different elements varies, some manufacturers using a thick plate with relatively low resistance separator so as to fill the voltage requirement, and figure on one or more reinsulations for the battery while in service. If a separator with higher resistance were used in a thick plate battery, the effect would be to lower the voltage characteristic and the capacity. This effect would be most noticeable at the high rates of discharge required for cranking service. Other manufacturers escape this effect by using a thinner plate, with more of them per cell. In this way they increase the capacity and raise the voltage characteristic through increasing the plate area. This enables them to use a separator of high resistance and still maintain a high voltage on discharge. It produces a battery that is more nearly balanced as to life of plates and separators, and cuts down the annoyance to the motorist by eliminating a large amount of battery trouble.

There is another beneficial feature that results from the use of the thin plate. Since there is greater plate surface the current density per square inch on charge and discharge is lower. There is, consequently, a smaller heating effect and better electrolyte circulation. This makes for longer plate and separator life.

Actual service tests have also shown that a thin plate battery does not need as frequent additions of distilled water in order to keep the electrolyte at the proper level.

In conclusion, to briefly summarize the transition from the original cell of Plante to the present starting and lighting storage battery, we find a gradual decrease in size, life, and storage abilities as we passed through the various stages of vehicle batteries to those most widely used today. On the other hand, there has been a marked increase in the capacities to be obtained per unit of weight, and in the mechanical construction.

It has been gratifying, indeed, to observe the satisfactory adoption of this delicate electro-chemical apparatus to the rugged service in which it is placed today.

Summary of an address upon "Automotive Batteries" delivered recently by K. W. Gasche, Chemical Engineer of the Westinghouse Union Battery Co., Swissvale, Pa., before the Automobile Service Association of Akron, O.

MOTOR AGE

Reg. U. S. Pat. Off.
PUBLISHED EVERY THURSDAY

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Vol. XLII Thursday, July 13, 1922 No. 2

THE CLASS JOURNAL COMPANY

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SUBSCRIPTION RATES
United States, Mexico and U. S. Possessions.....$3.00 per year
Canada.....5.00 per year
All Other Countries in Postal Union.....6.00 per year
Single Copies.....35 cents
Subscriptions accepted only from the Automotive Trade

Owned by United Publishers Corporation, Address 239 West 39th St., New York; H. M. Swetland, President; Charles G. Phillips, Vice-President; A. C. Pearson, Treasurer; Fritz J. Frank, Secretary.
Entered as second-class matter Sept. 19, 1899, at the post-office at Chicago, Ill., under the Act of March 3, 1879.
Member of Associated Business Papers, Inc.
Member of the Audit Bureau of Circulations.

A Constructive Work

AN excellent example of how a motor club can serve the dealer interests is supplied by the recent activities of the Illinois Automobile Club of Chicago.

This club, practically without assistance, undertook to break up an automobile trap that was being conducted by some special "officers" near the city limits of Chicago. The arrests and convictions of motorists by these officers would not stand the light of investigation and after a short but earnest effort on the part of the club officials, one objection to driving an automobile in the environs of Chicago was removed.

These automobile traps and the grafting that accompanied them is one of the objections that the salesman constantly meets. A man with an old car will not buy a new one because the old one is "good enough for business and you cannot drive out for recreation without being arrested" and so it goes. Every dealer knows the story and he has wondered many times how he can overcome this particular sales resistant. The Illinois Automobile Club had shown how these traps can be abolished.

With success comes help. This Club is receiving many complaints from motorists as to other graft nests. It appears that in almost every direction from the city such conditions exist. Many of these grafting "officers" arrest motorists because of defective lights and then release them when they buy "special" lamps from the "officer." The Club officers, having succeeded in one job, are having no trouble in lining up the prosecuting officials for further prosecutions. Before many weeks they will probably have smoothed out the path of the motorist in many directions from Chicago and, incidentally, have aided the Chicago and nearby dealers in making many sales. Is not a motor club with such aspirations and activities worthy of dealer support? Have you such a club in your community?

Incidentally, the president of the Illinois Automobile Club is a dealer and this Club has been supported by many of the dealers in Chicago.

The dealer who sells the blank wall of his establishment to a sign painter for another product is admitting that the other advertiser is smarter.

Thinking and Working

A CERTAIN man who has been through the mill in the automobile business and, because of his extensive experience, is now engaged in educational work, assisting others to become better mechanical and electrical repair men, was one day asked the nature of his business. In reply he stated that he was a teacher, and was very much amused to hear the remark, "Oh, I thought you were working."

The man with the teaching job naturally felt that he was working, yet at the end of the day it would be impossible to put one's finger on any material result.

In the ordinary sense work is usually a combination of mental and physical activity, even the laborer on the tracks doing enough thinking to properly direct his shovel and pick. To him the foreman is not working because the result of his thinking is not directly apparent, at least to the laborer, and yet his pay is larger and his value to the railroad evidently more. As we go higher and higher in the scale of intelligent activity we find the value rising as the work becomes more mental and less material, the architect being more valuable than the carpenter.

In the automobile service station, the same conditions are apparent, the work done usually containing a certain amount of mechanical movement, but its value increasing, as the worker's understanding of the job increases. Here two types of mentality are evident in most every repair shop. One is a type where lack of education is bolstered up by a boasted claim of superiority and unwillingness to be shown. In the other type more or less education, enables the man to see how much there is to learn, and how much can be obtained from books and papers covering the work in question.

The latter type of man is constantly reading the instructions sent out covering the particular car or kind of work he is handling, and is ready to get information from any and all sources, while the former is unwilling to read selected clippings of value even when posted on the bulletin board right before his nose.

In the electrical field the need of constant observation and study is more strikingly evident from the elusive nature of the forces involved, and mechanics or electricians who are not content to stand still should be constantly on the alert to pick up information wherever

it is available. Many a man gives up in disgust when trying to figure out some complicated wiring diagram, and yet he has probably made no attempt to get some fundamental ideas on electrical circuits. Public libraries, night schools, trade papers on the subject in question all afford opportunity for the ambitious man to pick up the ABC of electrical circuits, and the shop proprietor that encourages his men in work of this kind should find improved conditions in the running of his shop.

A striking mechanical example of the valve of observation was shown recently in a medium sized service station that had stocked rather heavily a certain make of used car during the winter and when putting these in condition to sell, found that many required taking up the main bearings which, under ordinary circumstances, was a long tedious job. In this station one of the men, who is constantly awake to find new ways of doing things better, had discovered in a trade paper a short cut for this job, the application of which to these used cars made it possible to put them in good condition and sell them at a profit, which might not otherwise have been possible. The lesson is obvious, help the men to help themselves for this will help you.

Forty-five per cent of a group of car dealers admitted that there was not an announcement on the outside of their establishments of the car they sold. Must have been ashamed of their connection, yet it was a good car.

Electrical Friction

ELECTRICITY on the motor car is as essential as bearings, and the observation of its action in some of the simpler cases will lead to a better understanding of the more complicated conditions which are also frequently encountered.

The helper removing the mud pan may do so with the help of the drop light, which in a general way he knows operates by means of electricity, but does it ever occur to him to find out why the filament gets hot while the wire that leads the current to and from the lamp does not. The answer is in the use of more or less resistance or electrical friction, which as in the case of a bearing produces more or less heat. In bearings we endeavor to have as little friction as possible while in brakes as much as possible. In the same way in the lamp cord we design the circuit or wire size to have as low a resistance as possible with a corresponding reduction of heat to a negligible point, while the filament of the lamp like the brake is designed for high electrical friction.

Yes there is a definite reason for the size of the starter cable, the ignition wiring or the lamp filament.

Would your wife buy groceries or drygoods of a store that treated her as you treat your customers?

Our Major Investments

ONLY a few months ago the poverty of the American people was a great worry of market statisticians and almost with one accord these authorities predicted that the motor vehicle was near the end of its course. All but a few factories would go broke during the year, the saturation point would be reached and the automotive dealers would be in the soup lines or living on their debts. You all know how black the picture was that we read in the economic magazines.

Then came that wonderful demand and burst of production speed which carried the figures upward and upward and still the factories and dealers were behind, despite the fact that May saw more cars and trucks produced than any previous months in the industry and then June went ahead of even that mark. The result has been that during the second quarter of the year approximately 725,000 vehicles were made and the total for the first six months of the year is about 1,125,000 cars and trucks.

These statisticians will probably tell us soon that this is an indication that the country is going to the bow-wows and we are spending all of our money for motor vehicles. Say these vehicles are worth $1,000 each. This sale represents a lot of money. But about 90 per cent of the sales are of an investment character. Today when a man buys a car or a truck, he buys it because it will increase his earning capacity, or for transportation to and from his new home or something of that kind.

But is this great investment in transportation abnormal? Let us look to other investments.

The financial statisticians tell us that during the first six months of this year this great American public invested in new issues of bonds to the extent of $1,871,335,000 aside from government bonds and that the official issues amounted to about $1,000,000,000 additional.

It would seem that when this great American public gets tired of buying silk shirts and other knicknacks that took so much money during the war prosperity years, that it has money for such conservative investments as bonds and transportation.

Volume of production lessens factory cost. Volume of sales also lessens the dealer's costs. Consequently volume increases the dealer's profits. Why not get volume by selling the car owner all of his needs?

Why Not Some Waste?

A RETAILER of gas and oil in the city of Chicago lost a very good customer during the July 4 holidays because one of his employees did not believe in waste.

It was this way: A car owner drove up to this filling station to buy gas and oil. The car owner just ahead of him had made similar purchases. The attendant served the car owner we speak of without wiping his hands. This man had just cleaned up his car and had driven out to get his supplies while his family was getting ready for the drive. He returned home and, while waiting, wished to make a slight adjustment under the hood. When he grasped the hood fasteners, he found his hands smeared with grease. He then looked over the car and found that the gas station attendant had left his mark in many places; on the fenders, on the gas tank and even on the back of the body. He vowed never to go back to this station again. During the holidays he was accorded the same treatment at another gas station. This was also blacklisted by him. But the first case is more important, as that is the convenient gas station for him to use.

All of this would have been averted if these gas station attendants had been equipped with some waste with which to wipe their hands after putting oil in the cars. Dealers who operate filling stations may find in this incident an explanaton of lost trade.

Industry Still At High Speed

Government Reports Labor Shortage in Automobile Plants

Country Forging Ahead to Industrial Prosperity, Department of Commerces Declares

WASHINGTON, July 10—Figures compiled by the Department of Labor in an industrial employment survey under the auspices of the United States Employment Service shows that the automobile industry is running at top speed. Overtime is the rule in most plants in the Detroit area and similar conditions are reported in other automobile manufacturing centers. Practically all automobile manufacturers report a shortage of skilled workers.

Statistics of employment for June show an increase of 6.5 per cent in the automobile industry over the preceding month.

In the opinion of the United States Employment Service "The country is steadily but surely forging its way toward a period of industrial prosperity in which it is possible that the labor supply will not equal the demand. As contrasted with opinion six months ago, a note of optimism pervades practically every industry in every section of the country."

Bidding for Help

Agents of the Employment Service at Detroit declare that the factories are bidding for skilled and unskilled labor. One firm in the city sent out a call for 400 jobs in one day but no applicants were received. About 3,000 men have been added to payrolls every week for the past five months. Automobile manufacturers in Detroit state that business is entirely satisfactory. One high priced motor company has a production schedule of 2,000 cars a month and orders have surpassed all previous records. Another company reached a record day for output on June 20.

In Flint, Mich., there was a shortage of workers, particularly tool makers, body builders, sheet metal workers and body finishers. One motor company in Flint is working a night shift and making 1,200 cars a day.

In Lansing and Muskegon, Michigan, all plants are working full time with a shortage of skilled laborers. There is also a shortage of skilled workers in the automobile industry in Wisconsin and Ohio. Automotive and rubber tire industries are very active in Ohio. In Cleveland, one large motor company reports production 50 per cent greater this June than in previous June. Factory outputs are sold for several months ahead. In Dayton automotive and pump companies report inadequate supply of laborers.

175,000th HUDSON CAR

DETROIT, July 7—The latter part of June marked the production of the 175,000th Hudson car and the 75,000th Essex. The Hudson-Super-six was turned out on June 20 and the Essex on June 22. The 175,000th Hudson, a 7-passenger phaeton, was shipped to the Hudson Automobile Co. of The Hague, export distributors for Holland.

Essex officials report that they expect to produce more than 30,000 cars this year, and figure that they will easily out-strip any previous year's production.

Church Capitalizes Sunday Touring

EVANSBURG, Pa., July 1—St. James' Church will be converted into a retreat, each Sunday, for motorists who feel the call of the wild and are attracted from their pews in city churches by balmy air and rural scenery. The Rev. C. F. Scofield, the rector, has set aside parking space for 800 automobiles and has issued invitations to automobile owners in the city churches, members of motoring clubs and the general motoring public to spin out to St. James'.

DEATH OF EDWARD V. HARTFORD

NEW YORK, July 6.—Edward Vassalo Hartford, an outstanding figure in the automotive industry, whose accomplishments will be long remembered, died June 30 at his city home, the Hotel Devon in West 55th Street. He was buried from the home of his parents at Orange, New Jersey. He was 52 years old. He is survived by a widow and two children.

As the manufacturer of the Hartford shock absorber which he put on the American market in 1904, the producer of one of the early electric starters, together with various other inventions, Hartford scored high in his efforts to better the modern motor car and the service it supplies. Besides heading E. V. Hartford, Inc., he was many years vice president of the Great Atlantic and Pacific Tea Co., a leader of the chain store system in this country.

NEW AIR COOLED CAR DELAYED

NEW YORK, July 11—Quantity production of the line of "copper air cooled" cars which General Motors Corp. proposes to put on the market probably will not be started for several months. It had been expected that they would be turned out in limited quantities by September, but C. F. Kettering, who has charge of their development, insists upon considerably more experimental work. He wants the new line tested under all kinds of weather conditions and on all kinds of roads.

$2,400 Increase in Price of Lincoln Town Car Model

Goes From $4,800 to $7,200—Fords Determined to Build America's Finest Automobile

DETROIT, July 8—Without formal announcement the town car of the Lincoln line has been remodeled and the price increased from $4,800 to $7,200. Previous to the sale of the plant to Ford in February, the town car had been $6,000. The new town car is understood to represent an Edsel Ford idea in fine car construction, the body work being of an exceptionally fine type.

Since the severance of relations between the Fords and Lelands, there have been no formal statements by either side, but a statement by Edsel Ford on Lincoln manufacturing policies is expected soon to be made. This statement will show that the Fords are undertaking to manufacture America's finest car, that the production will be on a limited basis, and that prices, if changed at all, will be increased compensating for the extra fine character of the general construction.

Price Not a Factor

Changes in prices made by Ford since taking over the Lincoln have been increases, the new prices being materially higher than formerly. In both revisions to date the construction of the car has undergone important changes, the improvement being principally in the bodies. Apparently the thought of competition has not been allowed to enter into the manufacturing plans, as the sole idea has been to make a very high type of car regardless of price.

Sales of Lincoln cars are reported to be running high and orders are said to be four months ahead of production. Output at the factory is ranging from 30 to 35 cars daily. A constant flow of orders is reported to be coming in despite the long wait for deliveries. Sales are being handled through the Ford sales office of which R. C. Getzinger, former Lincoln sales manager, is now a member.

ELCAR COMPANY CHANGES HANDS

FORT WAYNE, Ind., July 10.—The controlling interest in the Elkhart Carriage & Motor Car Co. has been secured by four Auburn men—A. M. Graffis, G. W. Bundy, F. B. Sears and W. H. Denison, who are now managing the plant. W. B. Pratt and George B. Pratt have retired from the company, which manufactures the "Elcar" automobile.

In the reorganization of the concern Sears will become president and general manager; Graffis will be secretary, Denison will be treasurer and Bundy will act as general superintendent.

Factory Men Optimistic After Tours

July Schedules of Detroit Plants Only Slightly Lower

A Few Factories Plan Somewhat Greater Production This Month Than in June

DETROIT, July 8—Reports received from factories in the Detroit district indicate that a compilation of figures on June production will show a slight increase over the record output of May. In most factories the variations were slight, due to the fact that capacity was reached in May, but better deliveries of materials and other causes enabled the June production to run just a trifle higher.

Production in July so far as the daily schedules are concerned will be practically identical with the schedules of May and June, but holidays early in the month and close-downs for inventory and vacation periods, will bring the monthly total considerably lower. The demand for cars is reported to be steady but falling off from the early spring rush. Dealers are reported to be holding orders strictly to a sales basis.

Columbia Motors, with the assurance of deliveries of materials for its light six, has set a schedule of 1,650 cars for July which will exceed its June total by 100 per cent. Two-thirds of this will be the light six and the remainder the former larger models.

Gray Motors has booked a total of 500 cars for July which will be its first full production month. First deliveries of the Gray were made late in June and consisted mainly of demonstration cars for dealers.

Incomplete figures for **Ford** business in June show that the schedule of 130,000 cars and trucks and 10,000 tractors was approximated. The company has set a similar schedule for July production and announces that this schedule is lower than the orders received from its dealers. There will be considerable orders carried over into August, for the most part these being in the closed models.

Dodge production is continuing at the rate of 550 to 600 daily and **Maxwell** at the rate of 300 to 350. In the latter's case the month's total will be lower owing to a week's closing for inventory in the first part of the month. **Durant** production is continuing at the rate of 100 daily, June being the largest month to date for the Lansing plant and increases are set for July and August. Production of the **Star** car will begin at the Lansing plant in August. **Dort Motor** production for June was lower than in May. The July schedule is fixed at from 50 to 70 cars daily.

Hudson Motor Car Co. reports an increase over its May total of about 5 per cent in June and expects to approximate the June production in July. In both the **Hudson** and **Essex** models the daily production is continuing at 275 to 300. **Hupp Motor Car Corp.** is continuing its schedule of 140 daily. In the first six months the company reports business to have reached about 18,000 of its planned 30,000 output for the year.

Chevrolet Motors is continuing on its schedule of about 1,000 daily, June production being about on a par with May. **Buick** has operated on part time in June owing to plant changes, but is prepared to resume on its regular schedule of about 350 cars daily in July. **Oldsmobile** is building at the rate of about 120 daily, a reduction from the May and June totals which were about alike. **Oakland** is running better than 100 cars daily and reports July business will be on a par with May and June.

Studebaker, because of the pressure of business, has postponed its regular inventory period and will continue manufacturing throughout July at the rate of 440 cars daily in all plants. This is at the same rate as in May and June and represents the utmost that present plants are capable of producing. **Paige** produced about 4,000 cars in June in its Paige and Jewett models, the total being about equal to the May output.

Slower in August

Cadillac is operating on a schedule of about 100 daily but looks for a seasonal fall in business toward the end of the month and in August. June production was about equal with May. **Wills-Ste. Claire** will be down for inventory in the first week of the month but will resume on its schedule of 25 to 30 daily working two shifts. **Packard** production in June on all models was about 1,800, the largest part being the new twin six model. July schedules call for a total of 2,000 cars and trucks. **Lincoln** is building about 35 cars daily and is four months behind on orders.

Earl Motors reports June to be the banner month of the company and is continuing on a schedule of about 65 cars daily. **Chalmers** production is running at the rate of 25 to 30 daily. **Liberty** is building 30 to 35 cars daily, plant capacity, and will continue at this rate through July and August.

Rickenbacker is continuing its schedule of 25 cars daily through July, and reports June to be about equal to May. **Reo** closed in the first two weeks of July for the regular vacation period.

MITCHELL FOUNDER DIES

NEW YORK, July 5—The death is announced at Monticello, Cal., of Frank L. Mitchell, founder and first president of the Mitchell Motor Car Co. He was 70 years old.

Three Executives Find Good Summer Sales Signs

Large Crops in West and South Bring Confidence — Farmers Show Interest in Cars

DETROIT, July 8—Business trips through three widely separated sections of the country by leading executives of three large producing companies in the latter part of June give indications of a satisfactory volume of business both for the immediate present and through the summer season.

Farmers in Better Finances

W. J. Mattimore, advertising manager of the Maxwell Motor Corp., has just concluded a trip from Richmond, Va., to Jacksonville, Fla., on which he visited important distributing centers along the coast. Practically all of the business now being done in this section, he said, is in the cities, with little buying in the farm sections. Prospects for crops, however, he said, were good and many farmers and planters are beginning to show an interest in cars. The district has been heavily in debt owing to the poor market conditions of the past two years, but bankers are looking to the marketing of this year's products to place the section in healthy financial condition.

Bumper crops will be the rule in Texas and that section of the south adjacent to the Mississippi, according to D. Minard Shaw, assistant sales manager of Earl Motors. Texas farmers have cashed in heavily on tomatoes, and other products now approaching the markets promise to yield equally satisfactory returns. Louisiana and Mississippi farmers are also in position to reap bountiful returns and there is every indication of a strong market for cars. Dealers in this section are beginning to place orders for cars with more confidence, Shaw said.

West and Southwest

Conditions in the west and southwest are improving rapidly, reports J. J. Cole, Jr., of the Cole Motor Car Co. Dealers are ordering cars for summer delivery and many new connections are being made, indicating renewed interest and confidence in the sales possibilities for cars. All sorts of crops, including wheat, rye and fruit in Minnesota and the Dakotas, berries in Arkansas and southern Missouri, wool in Montana, are doing well and finding good markets. Oil is in better condition in Texas and Oklahoma than for some time, he said, and there is much greater activity in the mining centers of Colorado.

17,038 Miles of Road Built With Federal Aid

14,491 Additional Miles Under Construction—Nebraska Leads With 93 Per Cent of Allotment

WASHINGTON, July 10—A total of 12,754 miles of federal aid highway has been constructed since the inception of the federal-state highway and highway transport program, the Bureau of Public Roads has announced. A survey of the progress done in highway construction, as of May 31, 1922, shows that the above amount of highway roads has already been completed and actually paid for.

Projects which have been completed, but on which final payment has not been made, aggregate 4,284 miles, and projects which are now under construction total 14,491 miles, of which 58 per cent is already completed. The figures show that the roads under construction, those completed and not paid for and those completed and fully paid for total 31,529 miles.

Minnesota leads with 1,109.7 miles of federal-aid highways, Texas comes second with 1,017 miles; Georgia, 697 miles; Illinois, 685 miles; Wisconsin, 672 miles, and Arkansas, Idaho, Montana, Ohio, Pennsylvania, and South Carolina, with approximately 400 miles each.

The figures show that good roads construction is being pushed hardest in Nebraska, Illinois ranking second and Arkansas third. Of the states named, Nebraska has completed 93 per cent of her pro rata of good roads, Illinois 84 per cent and Arkansas 69 per cent.

POWER FARMING BUREAU

CHICAGO, July 7—The Power Farming Bureau, with offices at 1456 Monadnock Building, Chicago, has been reorganized and incorporated by George E. Fuller, its former secretary. Last March a number of tractor manufacturers who had composed the membership of the Power Farming Bureau organized the National Institute of Progressive Farming, which was intended to succeed the Power Farming Bureau. Guy H. Hall of Kansas City was employed as secretary and manager.

Fuller said there was a demand on the part of some tractor manufacturers and gas engine manufacturers for the continuance of the Power Farming Bureau and he undertook the work of reorganization. Fred Tubbs of the Alamo Farm Light Co. is chairman of the executive committee. The publication of a monthly bulletin is proposed. Memberships are being solicited from firms and individuals.

FORDSON SHOW AT ST. LOUIS

ST. LOUIS, July 8—The first industrial tractor show ever conducted in St. Louis will be held on the large circus lot at Sarah street, and West Pine boulevard, July 12, 13 and 14 under the auspices of the Ford dealers of St. Louis and adjacent towns, in conjunction with the Ford Motor Co. branch in St. Louis.

The committee in charge of the show consists of D. B. Jones, Fordson representative of the Ford branch in St. Louis; W. D. Walsh of the Walsh Motor Co., Ollie E. Haupt of the Haupt Motor Car Co., F. S. Wiemeyer of the Kuhs Wiemeyer Motor Co., and H. C. Wright of the Ford Company.

Motion Picture Shows How Clutch Is Adjusted

CHICAGO, June 26—A motion picture showing how a clutch adjustment should be made and detailing the operations of removing, overhauling and setting up a clutch, has been prepared by the Borg & Beck Co., of Chicago. This film is available for exhibitions at trade association meetings, dealer conventions and service conferences.

The idea was conceived by William Mack, sales manager, who believes that many owners and service station managers consider the clutch somewhat of a mystery because it is hidden from view.

TIRE PRICES REDUCED

JEANNETTE, Pa., July 6—The Pennsylvania Rubber Co. of America, Inc., announces a price reduction on all sizes of its vacuum cup cord and fabric tires and tubes effective July 6. The new schedule shows the following reductions:

	Old Price	New Price
Vacuum Cup Tires—		
30x3½	$13.95	$11.95
30x4 (Cord)	32.50	29.25
Tubes—		
30x3½	2.35	1.95
32x4	3.25	3.05

DENVER, July 7—The Gates Rubber Co. announces reductions in tire prices effective July 1. Among the new prices are the following: 30x3½, fabric, $13.95; cord, $15.25; 32x4, fabric, $25.25; cord, $28.55; red tubes, 30x3½, $2.80.

MOON PRODUCTION INCREASING

ST. LOUIS, July 7—An increase of 15 per cent in unfilled orders on hand July 1 as compared with June 1, is reported by the Moon Motor Car Co. The company's June sales were 194 per cent greater than in June, 1921, and 90 per cent greater than in June, 1920. Officials of the company say they expect this month's production to exceed that of June by at least 75 per cent.

TIRE DEALERS ORGANIZE

DES MOINES, Ja., July 8.—Retail tire dealers of Des Moines have formed the Des Moines Tire Dealers Association and affiliated with the National Tire Dealers Association of America. A. R. Corning of the Corning Rubber Co., is president; Ward Schooler, of the Schooler Rubber Co., vice president and W. H. Bishop, of the Mid West Tire and Supply Co., secretary-treasurer.

A. A. A. Takes First Action Against Withdrawing Clubs

Board of Directors Expels Illinois Automobile Association from Membership

NEW YORK, July 8—The executive board of the American Automobile Association decided at a meeting here that the Ohio State Automobile Association was not functioning properly and admitted the Cincinnati Automobile Club to direct membership. A vote of appreciation was extended to the Youngstown club for its loyalty in refusing to join the state association in leaving the A. A. A. President Diehl announced that the Cincinnati and Youngstown club would be made the nucleus for a new state association.

The board announced that the Illinois association has been expelled from membership because of protesting checks and stopping payment on a recent check sent in payment of dues.

A committee consisting of David Jameson, Robert Hopper and Laurens Enos was appointed to investigate the sentiment of local clubs in all state associations which have withdrawn from A. A. A. No action was taken in regard to the appointment of a permanent executive secretary.

TO HAUL MILK BY TRUCK

WASHINGTON, July 8—Employment of motor trucks in the transportation of milk, on short line hauls from the "milk sheds" to large cities, will be undertaken at once. This announcement was made today by Charles Holman, Executive Secretary of the National Milk Producers' Association, composed of twenty-six allied associations and having more than 200,000 members.

Because of the rates on milk and cream, which are now being transported by the railways and on which the recent reduction of rates does not apply, the milk producers must perforce turn to some other source of transportation and the truck, the Association believes, offers the solution.

So convinced is the Association that it will be necessary to resort to truck transportation that they have asked the National Automobile Chamber of Commerce to submit proposals and data on the best method of solving the problem of the 200,000 milk producers, members of the association.

BETHLEHEM IN OPERATION

PHILADELPHIA, July 8—The newly reorganized Bethlehem Motors Corp. has begun operations at Pottstown and Allentown under Howard B. Hall, of New York, who is acting for the stockholders' syndicate. The plant is running 10 hours daily. The officials are optimistic about the motor truck business and soon will add to the working force.

Boston Dealers Turn From Loss to Profit on Used Cars

Automobiles Taken in Trade Formerly Sold for Less Than Allowances Now Bring More

BOSTON, July 8—From a loss of $94,000 in handling used cars during February and March to a profit of $9,574 on the April and May business, and thereby allowing the full profit on all new cars, is the interesting news conveyed to the Boston dealers in the second report issued by the Boston Used Car Statistical Bureau.

In February and March Boston dealers handled used cars as tradeins to the value of $593,807. But when they had been disposed of and the sheets were balanced up, they showed the $94,000 loss. The Used Car Statistical Bureau had just been organized and was functioning then. And the aftermath of the show with a lot of orders gave the new idea a thorough tryout. It has justified its existence.

In April and May the tradein used cars showed a total value of $1,176,081. This represented what was allowed on the cars. Upon these cars the dealers spent for repairs, replacements, storage and selling expenses $216,644. That ran the total up to $1,392,257. These cars were sold for $1,402,300, allowing a profit of $9,574. If an allowance is made for handling other used cars taken for reconditioned cars the balance may be lowered, but even at that the dealers would be breaking more than even.

The figures show that during April and May the dealers took in trade cars of their own make valued at $834,275 and spent $78,945 putting them into shape for resale, or about 10 per cent. In the same period cars valued at $341,806 net of the make they were handling were accepted by the dealers. And in reconditioning them for resale the dealers spent only $11,086, or about 3¼ per cent of the allowance price. This indicates that dealers take pride in putting cars of the make they sell into shape, but hurry out cars handled by other dealers.

BUS LINES TO FIGHT FOR RIGHTS

ATLANTA, Ga., July 10—The recently organized Georgia Bus Line Association at a meeting in Atlanta early in July decided to make a determined effort before the present session of the Georgia State Legislature to defeat the passage of a bill being sought by the short line railroads of the state, and which, if passed, would make the bus a common carrier subject to the same rules and regulations as the railroads, and under the jurisdiction of the State Railroad Commission. The association expressed itself as willing to confer with the railroads relative to a bill less stringent than the one proposed. If this fails a legislative committee will be named to make a fight against the passage of the bill proposed.

ATLANTA DEALERS' BOOKLET

ATLANTA, Ga., July 11—An interesting sales prospectus has just been issued by the Atlanta Automobile Association for distribution among members and non-members throughout this section, setting out what the association is, what it does, and why membership therein is genuinely valuable to every dealer. This organization is made up of automotive dealers and accessory dealers in Atlanta, now numbering more than 100 members. The new booklet deals specifically with the character of the association and of its dealer members. One of the principal features of the organization is the educational sales work it has carried on the past six months for the benefit of its members.

SELLING TRACTORS IN OHIO

COLUMBUS, O., July 11—A decided improvement in the demand for motor trucks and tractors is reported from all parts of central Ohio. Farmers are now in the market for tractors and farm trucks and this demand, coupled with the sales which have been running along other lines, has brought the volume of business up to most satisfactory levels. The generally improved industrial condition is the real cause for the improvement as optimism is taking the place of pessimism in all localities.

Mississippi Valley Automobile Trade Assn. Being Formed

ST. LOUIS, July 11—The formation of the Mississippi Valley Automobile Trade Association to be made up of automobile dealers representing the entire St. Louis district, including Eastern Missouri and Southern Illinois, was promoted at a meeting of the St. Louis Automobile Dealers Association last week. Preliminary steps for the association were taken by a committee including Harry Newman, of the Harry Newman, Inc.; Frank C. McDonald, of the Southwest Nash Co., and George Schroeder, of the Vesper Buick Co.

At the meeting a report was made by this committee favoring of a meeting in the near future to be attended by the president and secretary of all district automobile associations and in those districts where there was no association by leading dealers.

This committee will secure the names of the dealers whose memberships are desired and will report to the association a time and place for the organization meeting. Following the report, Harry Newman resigned from the committee and Joseph A. Schlecht of the Mound City Auto Co. was added to the committee.

Monument to Elwood Haynes Dedicated July 4 at Kokomo

INDIANAPOLIS, July 8 — Elwood Haynes received the national salute and heard prominent men eulogize him July 4 when Indiana commemorated before the nation his achievement in giving to the country a mechanically successful automobile and dedicated a monument on the spot from which the first Haynes was operated 28 years ago. Hundreds of citizens of Kokomo and the state joined in the observance on Pumkinvine Pike and listened to the address of Dr. G. L. MacIntosh, president of Wabash College, and others.

Mechanism of Haynes' first car

As the monument of granite with an inscription in stellite, another invention of Haynes, was unveiled by Mrs. John Edward Moore, past president of the Indiana Federation of Women's Clubs, the guns of Battery A, 150th Field Artillery boomed the national salute in honor of Haynes and his first little machine which the Smithsonian Institution had loaned for ceremonies. On behalf of the Indiana Historical Commission, Frank B. Wynn paid tribute to Haynes' achievement as did Frederick W. Fenn, representing the National Automobile Chamber of Commerce, who brought the greeting of the chamber. Mayor B. C. Moon of Kokomo made the address of welcome. Governor McCray of Indiana was represented by C. C. Shirley who declared the celebration commemorated an epochal event in the development of the automobile and modern transportation.

Haynes responded to the tribute and stated that at the original tryout there had been just four people. He narrated how the car had been hauled to the starting point where a marker now stands and had run a mile down the pike turned around and ran back to the starting point. In his tribute to the citizens of Kokomo, he said he was surprised that they stood for the annoyance that his machine caused them.

Wilbur D. Nesbit of Chicago was chairman of the occasion.

Nash Enlarging Plants for Production of 300 Cars a Day

Daily Output of Sixes and Fours Is Now 210—Car Is 93 Per Cent Company's Own Product

KENOSHA, Wis., July 7—One hundred and fifty Nash sixes are being manufactured a day at the factory here and 60 fours a day at the Milwaukee plant. Orders received indicate that the present schedule will be continued through July and August. Charles W. Nash, one of the most optimistic and yet conservative manufacturers in the industry, does not look for as much business during July and August as last year, when several price reductions that were delayed until July 1 held up a great deal of buying which made July and August the largest production months of 1921. Nash looks for a falling off of 10 to 15 per cent during these months, which would make them parallel the summer months of previous years, 1921 excepted.

Business is improving west of the Mississippi, C. B. Voorhies, vice-president in charge of distribution, reporting increased business from Kansas City and Salt Lake City, so that these two centers are now included among the ten centers that have in the last week shown the largest increase in retail sales. This is the first time these places have been included in the leading centers, as it is the first time that cities west of the Mississippi have qualified in such a list. It is a good indication of the business stimulation that is hoped to come because of the harvest and gives indication that the farmer is going to re-enter the buying market. Montana has recently come back into the market, doubtless due to the very considerable improvement in work.

The Nash Motors Co. is a leader among companies manufacturing a very large percentage of parts entering into its cars, the estimate being that upwards of 93 per cent of the car is produced in the Nash organization. Besides operating one of the best cast iron foundries in the industry, Nash manufactures all of the roller bearings used in his line. There is a most complete stamping department in which all stampings used are produced. The stamping department is fully equipped with batteries of presses for production of fenders, doors, and all body panels; and the forge department produces all forgings except those for the crankshafts. In the new building devoted to body manufacture is a complete installation of drying ovens, enamelling, and spraying equipment. For several years Nash has had one of the best wood working departments of any car maker. So complete is the system of trucks for handling the lumber that from the time it is unloaded off the railroad car into a factory truck, it is not rehandled from the truck until it has passed through the drying ovens and is ready to be sawed up.

The Nash plant in every department is very adequately equipped with racks, trays and trucks specially made for all parts so that no piece is even laid on the floor. Nash gives much of his personal time to production problems and is a leader in the economics of handling materials through the various production steps.

Contracts for additional buildings for the Milwaukee plant where the four is made will bring its capacity up to 100 cars a day. The present Kenosha plant has a capacity of 200 sixes, so that the two plants will soon have a 300 a day capacity.

George Fritz Resigns as Research Club Manager

CHICAGO, July 8.—George Fritz, who has been general manager of the Research Club for a year and a half, has resigned, effective Aug. 1. He has not announced his future plans and no successor has yet been chosen by the club. Robert Weinstock, of the Weinstock-Nichols Co., San Francisco, is president.

The Research Club is an organization of 18 jobbing houses in non-competing territories, which was formed in June, 1920, the idea being adapted from the drygoods trade. Its first activities had to do with business research along efficiency lines, but later it added cooperative buying. The club maintains headquarters in the State-Lake building, this city.

Fritz was the first manager employed by the club. Prior to that connection he was for four years field secretary of the Automotive Equipment Association. He has been in the automotive industry 13 years.

Georgia Dealers Undertake State Advertising Campaign

United Effort Will Be Made to Promote Public Confidence in Character and Stability of Retailers

ATLANTA, Ga., July 11—In order to raise the automotive industry to that degree of respect and public esteem which it merits, and to educate the buying public to the fact that the dealers engaged in the business throughout Georgia represent the highest type of merchants, the Georgia Automotive Dealers' Association, will inaugurate the latter part of July a state-wide advertising and publicity campaign, using practically all of the larger newspapers throughout the state. The campaign will be of an educational nature entirely, and will call for the expenditure of several thousand dollars during the remainder of the year.

Discussing the advertising plans of the association, P. A. Megahee, of Atlanta, secretary, said: "A part of the public still seems to look upon the automotive dealers as 'profiteers,' getting all they can for nothing and giving little in return, when as a matter of truth the majority of automobile dealers and manufacturers who remain in the business today are clean-cut, high-class business men. We know this, but the public does not seem to."

It is the plan of the association to run paid advertising in the Sunday newspapers over the state each week in which the effort will be made to "sell" the public confidence in the industry and its stability. These advertisements will be supplemented by continuous publicity stories serving a similar purpose. Members of the association in good standing only will be allowed to participate. With each advertisement will be published the names of all dealers and accessory merchants contributing to the cost of the campaign, which will aggregate about $100 each per half year. Already approximately half of the members have subscribed and it is believed that about 75 per cent of them will ultimately do so.

In order to make this campaign truthful and really effective, it has also been ruled by the association that hereafter no dealer will be admitted to membership whose application is not endorsed by at least two other dealers of his community and one banker in the town or city where his business is located. At the beginning of the new year the entire membership will be submitted to this same test. These facts will be brought out in the advertising that is to be published.

Another feature of the campaign is a complaint committee that will include several responsible dealers. Any complaint made by a customer about the treatment accorded him by any dealer in the association will be investigated by this committee.

Manufacturers and Dealers to Confer on Tire Selling

Effort Will Be Made to Adjust Distribution Plan Objected to by Exclusive Agencies

CLEVELAND, July 7.—The Board of Directors of the National Tire Dealers' Association and the governing board of the Rubber Association of America will meet shortly to plan for the adjustment and stabilization of the distribution of tires.

This important meeting comes as a result of a series of conferences in this city that preceded and followed a meeting of the Cleveland Retail Tire Dealers' Association in Hotel Winton June 30, presided over by R. F. Valentine, president of the National Tire Dealers' Association. It was the largest gathering of tire dealers and tire makers ever held in Ohio, and the plain talking indulged in by both dealers and makers sent both sides from the room with a source of information that was most enlightening.

The ball room of the hotel Winton was crowded with approximately 350 dealers, manufacturers and makers' representatives when President Valentine called for order. Men were present from New York City, Philadelphia, Washington, D. C., Seattle, Minneapolis, Milwaukee, Baltimore, St. Louis, Kansas City, Indianapolis, Akron, Canton, Detroit, Chicago and Cincinnati.

A roar of approval greeted the announcement by President Valentine at the start of the meeting that A. L. Viles, of New York City, manager of the Rubber Association, who was in Cleveland for the meeting, had stated that when the tire dealers named a committee the Rubber Association representatives would gladly meet with them and give consideration to what they had to present.

Judging by the statements made by the speakers, who came from all parts of the country, the question of making the dealers in tires exclusively compete with department stores, dry good stores, barber shops and other concerns that carry tires as a side line and cut tire prices to attract trade to the other departments of their businesses, will be one of the subjects discussed when the dealers' committee and the Rubber Association executive board get together for their conference. That method of disposing of tires by makers was most severely criticized.

The national accounts of the tire makers, the direct accounts with fleet owners the system of discounts, sales of tires to employes and the selling of the same make of tires to several dealers in the same trading radius were condemned by the speakers representing dealers.

Manufacturers came right back and charged the dealer watched his competitors and if he found one prospering in a certain neighborhood he would open a store next door or across the street; that although the leading tire manufacturers of the country had discontinued the mileage guarantee practically every issue of every newspaper in any city of size contains ads of dealers with 6,000, 8,000 to 12,000 miles guarantees.

John Deal, of the Mason Tire & Rubber Co., Kent, O., declared that it might be advisable to eliminate the discounts, establish a list price and hold the dealers to it. Dealers seemed to approve of this suggestion.

President Valentine read a statement from the sales manager of the Miller Rubber Co., in which the announcement was made that the tire service stations maintained by the company at Akron and Canton had been sold to the Instant Tire Service Co., of Youngstown. The National Tire Dealers Association, on behalf of Akron and Canton dealers, requested that the transfer of title to the stations be made.

The Miller executive stated that the service stations were established in line with a policy formulated to help the dealer dispose of tires, and that a selfish motive did not actuate the company when the stations were built. The hope was expressed that the action of the company in selling the stations at considerable of a sacrifice would be laid before the dealers of the country, as the Miller Rubber Co. wants their good will.

F. A. Seiberling, of the Seiberling Rubber Co., and founder of the Goodyear Rubber Co., was introduced as the first speaker of the evening.

Speaking of the dealers' problems Seiberling stated that there are far too many of them in business. He stated there are 50,000 legitimate tire dealers, 40,000 selling tires as a side line and possibly 30,000 others. With such a situation existing the dealers are bound to have trouble.

The manufacturing end is in the same boat. A few years ago there were 7 tire manufacturers; now there are 300. Today 10 companies manufacture four-fifths of the tires that are produced. The speaker said that many in both branches would be eliminated before the business gets down to rock bottom and then would come a healthy period for all. The legitimate tire dealer was pronounced the sound contact for the manufacturer and the argument was made that no business will survive that does not protect the dealer.

ALLEN ASSETS SOLD IN PARCELS

COLUMBUS, O., July 7—The sale of the assets of the Allen Motor Car Co., which was started June 27 under the receivers, George A. Archer and W. C. Willard, progressed satisfactorily with the exception of the real estate. The personal property was sold out in about 100 different lots and brought fairly good prices. Service rights were sold to A. O. Dunk, Detroit, at $66,000. A bid of $150,000 on the Columbus plant was not accepted as it is on the tax duplicate at $303,830. Steps will be taken to offer the plant for sale at a later date, according to the receivers.

Elaborate Summer Show by Chicago Dealers Planned

Exhibit at Pageant of Progress Counted Upon to Maintain Sales June Was Best Month

CHICAGO, July 10—Although the first few days of July have shown a slight slowing up of retail automobile sales in Chicago there is no indication of a slump. Some dealers have not yet caught up with deliveries which they were unable to make last month. Others have taken advantage of the good selling season to dispose of stocks of used cars, some having sold all used cars in stock and advertised in the newspapers for more.

Analysis of sales made in Chicago and Cook county on the time payment plan, constituting probably 65 to 70 per cent of the total sales, indicates that the high point of the season was reached here in the week ending May 27 when 1,261 time payment sales were recorded. The next highest week was that ending June 10 when 1,248 such sales were recorded. The record since that time has been: Week ending June 17, 1,197; June 24, 908; July 1, 927.

In the four weeks ending July 1 a total of 4,280 time sales was recorded compared with a total of 4,275 in the four weeks ending June 3. This indicates that May and June were practically equal as sales months, with June having a slight lead. There is no expectation among dealers that July will reach the May and June level, but on the other hand the opinion is general that the decline will be slight.

The dealers affiliated with the Chicago Automobile Trade Association are preparing for an elaborate showing of cars at the annual Chicago Pageant of Progress on the Municipal Pier July 29 to Aug. 14. They have taken a display section more than twice the size of that taken by any other industry and are counting upon this show to give a decided stimulus to late summer and early fall buying. It is believed that nearly every resident of Chicago and thousands from surrounding territory will attend this exposition and the dealers figure that it is the best opportunity of the year to have their goods seen by the maximum number of prospective customers.

SLIGHT DECLINE IN TOLEDO

TOLEDO, July 8—Automobile sales have declined here only slightly in the last two weeks. Some dealers report that they are holding up as well as they have for the last two months. All are considerably behind in the delivery of cars. The demand for light used cars is big now. The Willys-Overland branch here reports that sales are considerably ahead of deliveries and while declining slightly in the last 10 days they are far ahead of the same period in other years.

California Dealers Discuss Flat Rates at Convention

General Opinion Expressed That System Must Be Based on Experience of Individual Shops

LOS ANGELES, July 7.—The flat rate system of charges for automotive service repairs is gaining advocates, but not at any remarkable speed, according to opinions expressed at the convention of the Southern Division of the California Automobile Trade Association held at Pasadena June 26 and 27. Where somebody has pioneered the way and a schedule of charges for flat rate service is available the proposition was said to be feasible, but there were many present who claimed if the flat rate system is adopted it will have to be by every individual garage or repair operator.

Sentiment Shows Bases for Flat Rate

The sentiment expressed indicated that there are as many different bases for compiling the flat rate schedule as there are men in the business. A small town garage man cannot offer to make repairs using parts he has to pay more for than a big city distributor, it was asserted. Labor, rent, volume of business, and so many other factors must be taken into consideration when laying out the flat rate charges and if a competitor has not gone to the same point in ascertaining costs so that he sells his services for less and will get the business as the result there is a certain amount of apprehension in the minds of repairmen as to the merit of the system. It was said that where a dealer has practically no competition and where he has the only franchised sales depot for parts he can adopt the flat rate, simplify his operations, and profit from its use. The same was said to apply to a distributor who benefits on parts prices from the factory and has almost absolute control of the parts supply. The subject received general discussion, but indications were the flat rate system would not be adopted generally, at least for some time.

A general session of the Convention was held, but business chiefly was transacted at meetings of craft representatives. One of the most important questions discussed was that of free battery service, which brought about arguments at the session of the battery and electrical workers' craft. It was pointed out that with battery prices lower than ever before in the history of the business, the battery dealers' margin of profit is so reduced that the question of free service has become very important. Undoubtedly as the result of the discussion there will be developed a movement to eliminate free service on batteries represented by exclusive service stations. It was stated that where battery manufacturers have direct distributors giving free service, customers should expect that service from those stations only, as the garage or repair operator seldom sells these batteries and has no opportunity to make sufficient profit to cover the cost of subsequent service.

At the session of the automobile dealer craft the assertion was made that automobile trade conditions in Southern California are normal. Sales of new cars are good, especially among the lower price makes. It was evident, however, that there is not much chance for success and profit to dealers in the smaller cities and towns who undertook to handle a high price line exclusively. It was said the business horizon has cleared wonderfully in recent months and the used car situation is not as critical as last year. Members were warned of the necessity of maintaining a conservative attitude and not overvaluing used cars when offered in trade.

Object Lesson Helps Make a Good Salesman

CHICAGO, June 26—A Chicago automobile dealer claims that the best way to make a successful automobile salesman out of a mediocre one is to take him out and close a sale in his presence, showing him how it is done.

This dealer is O. G. Lindsey of the Diversey Motor Sales Co. "It is an easy matter," Lindsey said, "to forget what we have been told, but a practical demonstration of how the thing should be done always makes a lasting impression. Let a man listen while you are actually selling or trying to sell a car and he will discover his weak spots and gain many valuable ideas which he can put into practice."

STEPHENS INCREASING OUTPUT

FREEPORT, Ill., July 8—Twenty-five cars a day are being produced by the Stephens Motor Car Co., which output will be increased, the July output to approximate 650 cars, as compared with 425 for June and 430 for May. These are orders on hand to maintain this capacity during July and August. The Brush design of engine used in the Stephens has for the last two months been manufactured by the Stephens company at its large factory in Moline where a modern brick factory 1,200 ft. long by 120 ft. is utilized, present daily production being 30 engines.

At the two Freeport factories 520 men are employed, all of the open and enclosed bodies being done here as well as the chassis assembly and all sheet metal work. These factories have a capacity for 75 complete vehicles a day. The present Stephens output is 10 per cent enclosed types. The bodies are produced completely in these factories, the factories having very complete wood working mill, forge shop, sheet metal, upholstery, top and painting departments.

Receiver for Premier Co. Appointed in Friendly Suit

Action Said to Be Step of Creditors' Committee to Facilitate Plans for Reorganization

INDIANAPOLIS, July 7—A receiver was appointed for the Premier Motor Corporation, July 1, by Judge Linn D. Hay, of Superior Court of this city. The appointment of the Fletcher Savings and Trust Co. as receiver was made on a "friendly suit" filed earlier in the day by the American Foundry Co., one of the creditors of the Premier organization.

The Fletcher Saving and Trust Co. will continue to operate the concern along with a committee of stockholders and creditors who are planning a reorganization. It is said that pending the outcome of the receivership there will be no change in personnel of the officers of the concern.

The petition for a receiver was contained in what is called a friendly suit filed by attorneys for the American Foundry Co., which asked the court for judgment of $2,970,82 with 7 per cent interest from Oct. 1, 1920, alleged to be owed by the concern on a note. The complaint also alleged that the Premier organization owes numerous creditors more than $1,000,000 in the aggregate, but that the company has assets more than sufficient if the assets are properly conserved.

A number of large stockholders and creditors joined the foundry company in asking for a receivership, among them being J. A. Price, Okmulgee, Okla.; Newton P. Hutchinson, of Providence, R. I.; B. L. Craig, of Detroit, Mich., and M. B. Hottel, of Indianapolis, members of the reorganization committee which was formed some weeks ago.

It is said that ninety-five per cent of the creditors and stockholders of the concern had agreed to the plan of the committee, but that even a five per cent of the creditors might block the plan of the committee. It was in order to clear away such legal difficulties that the committee joined the foundry company in the suit in the hope that the plans may be completed with approval of the court and a judicial sale brought about at the time of the dismissal of the receivership.

Receiver Named in Delaware

WILMINGTON, Del., July 8—On a bill of complaint of the American Foundry Co., Chancellor Wolcott has appointed Elmer E. Mitchell of this city receiver for the Premier Motor Corporation chartered under the laws of Delaware. The chancellor has also issued a rule restraining the corporation, its directors, officers, agents and others from interfering with, transfering, selling or otherwise disposing of the property of the corporation or interfering with the possession or control of such property and assets.

IN THE RETAIL FIELD

Badger State Tire Co., Madison, Wis., established 10 months ago at 405 State street, has opened a branch store and service station at 605 University avenue in the same city.

Antigo Garage, Antigo, Wis., owned by Guenthener & Schoblasky has been acquired by George Kielcheski and Walter Dorszeski, who will continue the business under the name of General Garage. It will represent the Haynes.

Richter-LeRoy-Longren, Waukesha, Wis., operating the Service Garage, have filed voluntary petitions of bankruptcy individually as well as co-partners.

Osmond Jordan Co., Milwaukee, state distributor of the Jordan, has moved its headquarters from 433 Prospect avenue to 441-447 Jackson street. The Fowler Motor Car Co., located at the Jackson street address for several years, has been appointed retail Jordan dealer and will handle all service work.

Wisconsin Steamers, Inc., 543 Broadway, Milwaukee, has been appointed state distributor of the Cumberland cord tire, which is stock equipment on the Coats steam car, represented by the company in the Wisconsin territory.

P. R. Williams Motor Sales Co., Milwaukee, Maxwell and Chalmers dealer, has moved into new and larger sales and service headquarters at Fourth and Cedar streets.

Bachman Motor Co., Milwaukee, for many years Dort distributor at Fourth and Cedar streets, and now in its new headquarters building at Van Buren and Mason streets, has been appointed distributor of the Stephens Salient Six in Milwaukee and adjacent territory.

East Side Paige Co., Milwaukee, has been formed to serve as a retail dealer in the Paige and Jewett, with headquarters at 433 Prospect avenue.

Zastrow's Auto Service & Sales Co., Milwaukee, is a new $5,000 corporation organized by H. A. Zastrow, 846 National avenue, to conduct a general repair and service shop, deal in new and used cars, etc.

Automotive Service, Inc., Kenosha, Wis., has been incorporated with $10,000 capital stock by George B. Robinson, James F. Knapp and James Millon, all of Kenosha.

Linford Motor Co., Memphis, Tenn., composed of all local Ford dealers with a capital stock of $80,000, was recently granted a charter to handle the Lincoln and Ford automobiles. Headed by Geo. Abernathy, formerly of the Abernathy Co., other members are Robt. T. Chambers, of Universal Motor Car Co.; Horace H. Hull, of the Hull-Dobbs Motor Car Co.; J. T. Merrin, of the Merrin-Graham Co.; B. F. McCreery, of the McCreery-Pheland; Harry L. Price, of the Price, Barwick and J. M. Walker of the Universal.

City Auto Repair Co., conducting a garage and maintenance station and handling the Dort has insured all its employees under a group policy.

Winton Company, Cleveland, announced recently that the Garland Automobile Co. of New York, has taken over the Winton car sales in the Metropolitan district. The Winton building at Broadway and 70th street, has been sold to the Studebaker Corporation and possession will be given on July 1.

C. P. Brewer, Spokane, Wash., who has been handling used cars, has become an associate of James L. Elam of the James L. Elam Auto Co., 1313 W. First avenue, in handling Paige and Jewett automobiles.

Albert Jarvis of the Olive street garage, Greenfield, Mass., has taken over the Oldsmobile agency, sales and service, from the Dunbar-Lyon Co., of that town.

T. J. Howard has opened a store in Springfield, Mass., for retailing Fisk tires. He was formerly a traveling representative for the Fisk Rubber Co., and for some time was manager of the factory branch at Chicopee Falls.

Landman-Griffith Co., Toledo, distributors of the Maxwell-Chalmers line in this territory, were successful in a field of 19 dealers in landing the Packard agency for northwestern Ohio. William Love, former Packard dealer, relinquished the agency a few weeks ago. The new dealers will take up the Packard on July 1. Their new sales and service home at Warren and Adams streets has been open less than a year. Warren E. Griffith is president.

Nash-McKeough Motor Co., is a new Toledo distributing firm organized by J. W. McKeough, of Kenosha, Wis., who was formerly manager of sales for the motor truck division of the Nash Motors Co. A direct factory arrangement has been made. R. W. Kinsey, formerly sales manager of the Nash Milwaukee branch, will be sales manager of the new Toledo company. C. J. Flanigan, territory manager of the Chicago district, will come here to have charge of the wholesale business.

Franklin Automotive Electric Co., Toledo, is a new battery company organized with F. T. Dickinson as manager for distribution of Wol-Kee and Red Cap batteries in Toledo and for battery service. Offices and factory is located at 114-116 Eleventh street.

Standardized Parts Corp., Memphis, Tenn., at Monroe avenue and Wellington street, are now operating a central parts depot for five specialized units and have been appointed by the makers of the Continental Red Seal Motors, Timken axles, Borg and Beck clutches, Spicer Universal joints, and Brown-Lipe transmission and clutches to act as distributors in the Memphis territory for their products.

Vista Garage and Motor Sales Co., 823 E. 47th street, is a new Jackson dealer in Chicago.

Monarch Motor Car Co., 1312 South Grand avenue, St. Louis, has been appointed distributors for the Davis automobile for St. Louis and adjacent territory. The company also is distributor of the Stanwood Six.

A. Carlow Brown Co., distributing the R. & V. Knight car, has moved to 1819 Nicollet avenue, Minneapolis, into a new building. The company has added a garage business and in the move, about two miles eastward, has acquired much larger show space and service station. The new machine shop will handle repairs on all cars.

Western Auto Supply Co. has opened a retail store at 900 Hennepin avenue, Minneapolis, the fifty-ninth store. A. Henderson is manager. This company has only one store east of the Mississippi river, at St. Paul.

New York Auto Supply Co., organized by Minneapolis men to take over the stock and lease of the Times Square Auto Supply Co., at 1229 Hennepin avenue, is headed by Bernard Schwartz, who has conducted the Minneapolis branch of the company since it was started. The business is wholesale, retail and mail order. Morris F. Levitt is treasurer and C. L. Levitt is secretary.

F. H. Brown, Geneseo, Ill., has broken ground for a modern garage with a 90 foot frontage and a depth of 135 feet. The structure will be of two stories and of fireproof construction. It will be ready for occupancy about Sept. 1.

Robert Hale, Mason City, Ill., has purchased the garage established several years ago by J. H. Diers at the corner of Pine and Tonica streets and will distribute the Ford car and Fordson tractor. This is one of the finest plants of central Illinois, containing a sales room, office, machine shop, storage department and other features.

Willys-Overland, Inc., branch at Fourteenth and Adams street, Toledo, has a most striking window display in a large city map with 675 green tacks marking the homes of Willys-Overland owners and 250 red tacks marking residences of owners of Willys-Knights sold this year. The plan is to keep the map up to date for the rest of the year as a sales booster.

Gates Auto & Lubricating Co., Springfield, Ill., has certified to the secretary of state of an increase in the capital stock from $25,000 to $30,000, and also to a change in name to the Nu Way Auto Laundry Company. The company will specialize in the washing, lubricating, and general service of cars.

F. B. Smalley Co., Toledo, has been made distributor for northwestern Ohio of the Ruggles trucks.

Winton Company, Cleveland, announced today that the George W. Canterbury, Inc., of Boston, one of the best known units in the automobile distributing organization in the east, has taken over the sale of the Winton car in the Boston territory.

Murphy Motor Car Co., headed by Thomas W. Murphy, for the past five years one of the leading used car dealers of the city, has been granted the franchise for the Auburn for this territory. Recently the car has not been represented here. Murphy will have the distribution for Oregon and southwest Washington and will handle the retail sales in Portland.

A. L. McCarley, agent for the Stanley steam car for the Portland district, has secured the Templar car as an addition and will distribute the car in Oregon and southwest Washington. W. W. Wray, who was head of the Wray Motor Co., former Templar distributor, has been named Templar sales maanger for McCarley in Portland.

George Means, one of the oldest dealers in Des Moines, has bought the interest of his partner in the Means-Kucker Auto Co. and the business will now be conducted as the Means-Chevrolet Sales Co. Until a few months ago it was a direct factory branch of the Chevrolet.

A. G. Graben Motor Co., which recently took the Durant contract, will build a new salesroom at Fifteenth and Locust streets this summer.

Frank K. Taylor has taken the Columbia agency and opened a salesroom at 307 Tenth street, Des Moines.

Union Motor Co., Waterloo, Iowa, will distribute the Packard.

Snow Auto Co., Ottumwa, Iowa, will handle Overland and Willys Knights in addition to the Maxwell-Chalmers line.

L. J. Davey, Des Moines, has taken on the Marmon.

Battery Dealers Find New Field of Profit in Radio

Many Sales and Much Recharging Business Comes From the Wireless Fans

DALLAS, Tex., July 7—The battery dealer who does not carry a line of batteries for radio receiving instruments and make arrangements for charging those batteries is overlooking some good money, according to battery agents at Dallas and Fort Worth. They are carrying a complete line of batteries for radio and are selling them like hot cakes. More than that, these stations are prepared for recharging these batteries and are doing a wonderful business in that line.

The radio bug has grabbed Texas. Right in the cities of Dallas and Fort Worth there are literally thousands of radio receiving sets where folks are "listening in" and the number is growing. Out in the country, farmers, and in the small towns, business men and others have their receiving sets.

The battery men in Dallas and Fort Worth have found that while the "small radio bug" bites the prospect first, and because of that bite an amateur set is rigged up for a few dollars for the purpose of listening at local concerts, the "bigger bug" always follows and nips the prospect for a machine with which he can listen in on folks a hundred or a thousand miles away. That kind of set requires a battery. Dallas and Fort Worth battery agents have not been asleep on the job. They get a list of the radio fans and keep constantly revising it. They know it is but a matter of days until a fan is going to be dissatisfied with the small set and install a larger one which requires a battery. They are on the job, and sell that battery. With the sale they cinch the job of recharging the batteries for all time.

N. A. D. A. IN NEW ENGLAND

BOSTON, July 8—New England is being covered now by C. M. Drury, one of the field agents of the N. A. D. A., to build up the organization under the plan "One of a Thousand." He was a guest at a dinner held at the Hotel Lenox yesterday called by President John H. MacAlman and Secretary Chester I. Campbell, of the Boston Automobile Dealers' Association, and Amos J. Shorey, one of the directors of the N. A. D. A.

BUSINESS NOTES

New Automotive Incorporations, listed at the secretary of state's office in Springfield, Ill., show the following: **Advance Puncture Proof Tube Co.,** 38 S. Dearborn street, Chicago, manufacturers and dealers in tires and accessories, capital, $20,000; **Guaranteed Gear Service Co.,** 1714 S. Michigan avenue, Chicago, manufacturers and dealers in accessories and equipment; **Smith Motor Truck Co.,** 2617 S. Wabash avenue, is another new incorporation to deal in trucks and accessories.

Western Auto Sales Co., 65th street and S. Western avenue, is the name of a new Buick agency recently opened in Chicago.

Thos L. Hagen, building contractor, says he has more contracts for garages to be built in and around Chicago than any other type of building. This, of course, includes greasing and oiling and gasoline stations.

Federal Garage, Brattleboro, Vt., has bought the four-story Ullery building in that town and will use part of the ground floor and basement as salesrooms for cars and accessories.

I. J. Cooper Rubber Co., Birmingham, Ala., has retired from the general accessory business and in the future will handle its own manufactured products exclusively, which consist of tires, tubes, storage batteries and battery parts.

Miller Rubber Co., Akron, has sold its Akron and Canton tire service stations to the Instant Tire Service Co. The new company requires the entire fleet of service cars in both cities and is continuing the tire service inaugurated by the Miller company. The purposes of the Miller company in establishing the Akron and Canton service stations was to work out a system of tire service for dealers and retail agencies throughout the country. This system is now in operation by Miller dealers and the company believes its purpose has been accomplished.

Hartford Auto Parts Corp. has been organized to take over the plant of the defunct Hartford Automotive Parts Co., and is backed by the Spicer Manufacturing Co., of Plainfield, N. J. The officer personnel is all from New Jersey, as follows: President, Charles A. Dana who is the directing head of the Spicer company; vice-president, John S. Berry of Plainfield; treasurer and secretary, Paul D. Hawkins, Plainfield.

Lawwell-McLeish Co., at 241 North Fourth street, Columbus, Ohio, has taken over the agency for the Lincoln in central Ohio as well as the servicing of these cars. The department was taken over from the Ellis Motor Car Co., which formerly represented that line. To accommodate the new service station an addition 65 by 90 feet and two stories high will be built on the rear of the lot and negotiations are in progress for additional frontage.

Akron-Oldsmobile Co., Akron, Ohio, has been chartered with a capital of $10,000 to deal in cars and do a general garage business. The place of business is at 888 East Market street. Incorporators are A. J. Akers, George L. Albright, Roy B. Meade, Martha H. Terrell and William D. Held.

Frank Motor Sales Co., Akron, Ohio, has been chartered with a capital of $100,000 to deal in automobiles, trucks and tractors. Incorporators are John C. Frank, Charles W. Frank, Paul A. Frank, Ambos W. Dyer and Ford L. Carpenter.

John Cianflona has been appointed receiver for the Taylor-McQuigg Motor Co., Columbus, Ohio, which has been operating a sales agency at 327 East Broad street, upon the application of Margaret McQuigg who claims to be surety on a $4,500 note. Bond was fixed at $15,000.

Hamey-Eich Co., Columbus, Ohio, distributor for the Dort has moved from 169 N. Fourth street, to larger quarters at 200 East Gay street.

Litter Machine Shop, 240 North Fourth street, Columbus, Ohio, automobile repairing has doubled its floor space by taking in an additional store room and will increase its facilities.

T. W. Pickard Co., Columbus, Ohio, distributor for the Panyard piston rings has moved from 40 North Front street, to 228 North Fourth street.

Western Gear and Parts Co., Dallas, Texas, makers of automobile parts here, will open a branch office and store in Fort Worth, J. H. Connell, president of the company announces.

Standard Spring and Axle Co., Dallas, Texas, makers and jobbers of spring and axles for automobiles, has purchased the Carlton Auto Spring Co., of this city, and the plants have been combined.

Automobile Club of Hartford, Conn., has begun publication of the club magazine called the Automobiler which will be used to convey to the members various matters of interest.

Martin-Parry Co. has opened assembly plants in Omaha, Denver, Salt Lake City, San Francisco and Los Angeles. These plants are to give commercial body requirements to either dealers or truck users.

Jack Tire and Rubber Co.'s plant at Spokane has a payroll of 50 people and is making 50 tires and tubes per day, according to T. G. Richards, president and manager of the company. The plant commenced operation March 15 and has gradually increased production in three months. The capacity of the present equipment and working force is 100 tires and tubes daily.

Fyrac Manufacturing Co., Rockford, Ill., manufacturers of spark plugs, announce that sales during the first six months of 1922 have surpassed the total year's business in 1921.

Checker Motor Supply, Cedar Rapids, Iowa, opened this week will deal in accessories, tires and motor supplies. E. C. Hoover, sales manager and purchasing agent of the Western Auto Specialty Co. for four years, heads the new company and will devote his entire time to the business.

Wedler-Shuford Co., wholesalers of automobile accessories and manufacturers of products under the name "Wedford," has moved from the second floor at Nineteenth and Locust streets to the ground floor premises, 3540 Olive street, St. Louis.

Frank Brown, has awarded contract for construction of a one-story, modern brick garage in Geneseo, Ill., to J. M. Shaddinger. Cost of the garage will be about $18,000. It will be 90x126 feet and will be occupied by the Brown Motor Co., which operates garages in both Geneseo and Osco, Ill.

Bangert Motor Co., Taylorville, Ill., has certified to the secretary of state to a dissolution of the corporation and has surrendered its charter. The company was incorporated in 1914 with capital stock of $10,000. Ralph D. Ricks was president.

Lonergan Automotive Radiator Co., Rock Island, Ill., recently organized with H. F. Downing as general manager, has installed equipment at the plant, 1918 Third avenue, sufficient to manufacture fifty radiators a week. Production starts July 15 with thirty-five mechanics. The present quarters are only temporary but will serve until a larger building can be erected.

T. C. Vawter, Danville, Ill., for three years distributor of the Overland and Willys-Knight cars, has retired from that organization and has been succeeded by A. L. Donovan of Chicago who has been with the Overland company for twelve years.

Norman E. Stoneburg, Toledo, has been appointed new distributor for Stutz cars in 18 counties of northwestern Ohio. He was formerly manager of the used car department of the Sturdevant-Jones Co., and is well equipped with showroom at 134 Eleventh street to take up the business given up by Norman E. Moses. Ralph Benton, service manager, and Charles Beckerman, used car man, will be associated with Stoneburg.

Louis Sonneville, 800 Eighteenth avenue, Moline, Ill., is preparing for construction of 30x70 foot one-story garage building with showrooms at cost of $15,000.

Robert H. Hassler, Inc., manufacturers of Hassler Shock Absorbers, will build a new sales station on Meridian street, Indianapolis, that will cost $75,000.

St. Louis Branch Sales and Service Departments of the White Co. are now installed in their new home 4151-61 Forest Park building, which has been especially designed and built for their respective needs.

Kokomo Rubber Co., of Kokomo, Ind., has opened a St. Louis branch at 2001 Locust street, where the Kokomo Tire formerly was sold and serviced by the Zerweck-Grayson Tire Co. as distributor. Walter W. Napier, formerly Kansas City representative of the Kokomo Rubber Co., has been appointed manager of the St. Louis branch.

NEW STANDARD TRUCK

DETROIT, July 8—A new model 75 light delivery truck is being manufactured by the Standard Motor Truck Co. to sell for $1,330. It has a capacity of 1¼ tons exclusive of the body allowance and has 35x5 pneumatic cord tires. Drive is by worm type Timken axle.

Birmingham Business Better on July 1 Than in 12 Months

Increase of From Fifteen to Twenty-Five Per Cent in June Sales; Outlook Good

BIRMINGHAM, ALA., July 1—Stimulated by the industrial revival in the Birmingham district, automobile sales have shown an increase here of 15 to 25 per cent during the last 30 days, according to local dealers. Business among the dealers is declared to be better on July 1 than it has been for twelve months or more.

Several local agencies held their annual used car sales during the month of June, and some of them report the sale of more used machines than new ones as a result of their used car advertising campaigns. However, they are placing new cars in large numbers, they say, and there is scarcely an automobile dealer in Birmingham who is not optimistic or even enthusiastic not alone because of the unusually good business which is being done, but also because of the fine prospect for fall business.

Virtually every mine, furnace, factory and industrial plant in the Birmingham district, which includes many miles surrounding the city, is in operation now, after a period of inactivity which lasted nearly two years, according to the Birmingham Chamber of Commerce. Shortage of labor in some industries is reported, and there is no longer any unemployment in the district . This general revival is naturally being felt by the automobile industry, although its full effect, it is believed, has not yet fully developed in that line.

100,000 MILE DRIVERS' CLUB

CLEVELAND, O., July 3—The Chandler Automobile Co. has organized the Chandler 100,000 Mile Club, the membership of which consist of Chandler owners who have driven their cars 100,000 miles or more.

The emblem of the club, which may be attached to the radiator, is an oblong brass plate bearing the words "Chandler 100,000 Mile Club Member."

Eighteen states are represented in the membership. Washington leads with eight members, California and Massachusetts each have six and Pennsylvania has five. Included in the membership is a Boston owner whose car is the first one that was shipped from the Chandler factory nine years ago. This car is said to have been driven 250,000 miles. It is still in service. The average mileage of the club members is said to be 127,658.

NEW CANADIAN PLANT

Detroit, June 26—The Detroit Steam Motors Corp., manufacturing the Trask Detroit Steamer, will open a plant at Windsor, Ontario, under the name of the Windsor Steam Motors, according to A. B. Muir of this city.

CONCERNING MEN YOU KNOW

William F. Hedges, well known in automobile tire circles, has retired from business in Fort Wayne to become manager of the Middle States Branch of the Hydro-United Tire Co., 3617 South Ashland avenue, Chicago.

B. D. Jones, who was formerly with the Watson- Buick Co., Ogden, Utah, has been appointed sales manager for the Pacific Nash Motor Co., succeeding C. E. Cookerly, resigned.

Edward C. Meyer, a salesman for the Motor & Machinists' Supply Co., Kansas City, was slain by robbers last Saturday morning in the office of the Merchants' Delivery Co., where he was taking an order. He was 47 years old.

Guy Butler, of the Overland Sales Co., Jackson, was elected to the directorate of the Michigan Automotive Trade Assn. at the meeting of its officers and directors at the Hotel Addison, on Wednesday. Butler will serve out the term of Gilbert Loomis, of the Gilbert Loomis Motors Co., of Jackson, for District No. 2, and which expires in May, 1924. Butler is also secretary of the Jackson Automobile Dealers Association.

H. E. Lersch has been appointed manager of the Republic Truck Sales Corp., factory branch at 2444-46 Lisbon avenue, Milwaukee, Wis.

Floyd H. Smith, formerly with the Pierce-Arrow Motor Car Co., Buffalo, N. Y., as director of purchases, has become associated with the Simms Magneto of East Orange, N. J., as assistant general manager.

H. H. Sherlock, of the factory accounting department of the Goodyear Tire & Rubber Co., Akron, Ohio, has been named manager of sales accounting. He succeeds Fred Nash, one of Goodyear's oldest executives in point of service, who has been granted a two months leave of absence and who will take up other work when he returns to Goodyear.

W. A. Chapman, well known in St. Louis through his connections with the Skelton automobile, produced in the automobile department of the St. Louis Car Co., has been appointed director of sales of the Dorris Motor Car Co.

C. A. Wetherbee, for many years connected with the truck business in St. Louis has been appointed general sales manager of the Eagle Truck.

Clifton Reeves, industrial engineer of the Willys-Overland Co., has been named chairman of the Toledo section of the American Society of Mechanical Engineers.

Conrad Welling, who for the past 6 years was president and general manager of the Welling Motor Co. which formerly distributed the Olympian, Friend, Crow Elkart and All American Truck, has been appointed special supervisor of service for the St. Louis Motor Car Co., Jordan and Cleveland distributor.

R. J. Goldie, for six years factory manager of the Columbia Axle Co., has been appointed general manager of the Ruggles Motor Truck Co., Saginaw, Mich. Frank W. Ruggles, who had been functioning as general manager since the foundation of the company will remain as president but will devote himself to the wider interests of the business.

David J. Willoughby has been appointed sales manager of the Columbia Motors Co., Detroit, Mich.

Louis A. Muessel, president of the Muessel Motor Co., St. Paul, has been elected international trustee for the Kiwanis club.

A. E. Maltby has resigned as vice-president and general maanger of the Guy A. Willey Motor Co., Philadelphia, distributor of Paige and Jewett cars, and has been succeeded by I. F. Carter.

Proposal to Tax Gasoline For Road Upkeep in Ohio

TOLEDO, July 10.—Tax on gasoline will probably be the next method of financing road construction and maintenance to be attempted in Ohio. County Commissioner John Jackman, of Lucas county, has already made plans to have the Toledo representatives in the state legislature introduce such a measure at the next session.

Jackman says his proposal will reduce high license fees and place the burden of road improvement on those who use the roads.

"Suppose a tax of one cent a gallon be imposed on gasoline sales," said Jackman. "The man using 10 gallons a week and doing little damage would pay 10 cents a week while the company that operates a great fleet of trucks using thousands of gallons and doing thousands of dollars of damage to roads would bear their share.

"Thus the pedestrian who does practically no damage to a road will not have to share the burden of upkeep. Under the present system 95 per cent of the automobile owners and pedestrians are paying taxes for damages done by the remaining five per cent of car owners.

"In addition, tourists and truckers not citizens of the state, would have to pay a share of the highway burden."

DURANT TO BID FOR LOCOMOBILE

NEW YORK, July 8—There is substantial reason for believing that the Locomobile, or a modification of it, will be added in the near future to the line of cars controlled by Durant Motors, Inc. Bids for the property have been asked by the receivers of the Locomobile company and when the day of the sale arrives one of the bidders undoubtedly will be Durant Motors. The situation is similar to that which resulted in the purchase of the Elizabeth plant from the Willys Corp., when it was auctioned off by the receivers under the direction of the Federal courts.

If Durant obtains the Locomobile plant and the right to manufacture the car, drastic reductions will be made in manufacturing costs so that the price can be reduced to a figure where it can compete with Cadillac and Lincoln.

STAR SALES CO. INCORPORATED

DETROIT, July 7—Articles of incorporation of The Star Corporation of Michigan were filed in Lansing last week. Capitalization is for $20,000, but this amount is to be increased, it was declared. The Michigan company will be the sales organization for the cars made at the Lansing plant of the Durant Motors. It was announced that a distribution plan entirely new in the automobile field will be made public soon in connection with the new Star car.

TRACTOR CO. MAINTAINS SCHEDULE

JANESVILLE, Wis., July 6—Despite the fact that the spring rush is over, the Samson Tractor Co. is keeping operations of its main works at Janesville, Wis., at the same point as for the past 60 to 90 days, when a schedule of 25 to 35 tractors a day was necessary to meet orders. New business is being booked in a quantity sufficient to absorb this output, and practically nothing in the way of a surplus is accumulating for warehouses. The Samson farm truck also is being produced in quantity on a schedule heavier than ever reached heretofore.

Automobile Sales Show Great Increase in Iowa

New Retail Agencies Open as Agricultural State Experiences Surprising Comeback

DES MOINES, Ia., July 8.—Six months ago there was little or no indication that the automobile business would come back in the Hawkeye state as it has done in the last 90 days. On Jan. 1 there was little but gloom in Iowa, as the business of the state is largely dependent upon the farmer and the collapse of produce prices had wrought havoc with the farmer. However, with general business rallying, the motor car business came back with a bang and for 90 days there has been a demand, particularly in the cities of the state, which was not expected for at least a year. Any number of Des Moines dealers report business far beyond that of 1921 and many of them are far behind their orders on account of failure to secure deliveries.

The Herring Motor Co., Ford dealers, report that they have sold more cars at retail during the past six weeks than at any time in their history. Although the demand from the farmers is still backward the farmer has secured some money through the sale of hogs and the condition is better than it has been for 18 months. There is no sign however of a general revival of farm business until after the present crops are harvested and then only in the event of improved prices for farm crops.

Evidences of the general improvement of the motor car business in Iowa are the renewing of contracts and the opening of new agencies in various parts of the state. Last winter there was a large number of retirements from the business by firms which were not well established. With the rebound there are at present almost the normal number of dealers doing business in the state.

"REPAIR ARM" PATENTS UPHELD

PHILADELPHIA, July 7—Upon petition of the Hudson Motor Specialties Co., the Federal court for the northern district of Ohio has granted it a perpetual injunction restraining the Simmons Mfg. Co., the Lake Erie Accessories Co., the M & M Co. and the American Signal Co. from using or selling lugs for power plant support for motor vehicles embodying the inventions described in patent No. 1,263,899, as well as from using in conjunction with the manufacture or sale of any motor support or lugs for power plant support the name "Crankcase Repair Arm."

COLE IMPROVEMENT 100 PER CENT

INDIANAPOLIS, July 8—The Cole Motor Car Co. is running 100 per cent ahead of last year's production, according to a statement issued by J. J. Cole, president and general manager of the company, and at a rate which is equal to 85 per cent of capacity.

The Readers' Clearing House

Questions & Answers on Dealers' Problems

REMODELING FRONT TO ADD FILLING STATION

PLAN 438

Q—We have MOTOR AGE on file for the past two years. We are enclosing a blue print of our property. The ground is entirely covered by our building. Would like some suggestions from you in regard to changing the front of the building into a grease and oil service station, that is, doing away with the present office and display room and converting the front into a two-way service station and not take any more in the depth of the building than is actually necessary. We would not like to take more in depth off the building than the present side door on Poplar St. Can this be done? Any suggestions you can give us toward making the change will be appreciated.—B. & B. Motor Co., Johnstown, Pa.

Our plan shows how you can very nicely build a filling station by removing your front wall and 20 ft. of the showroom space.

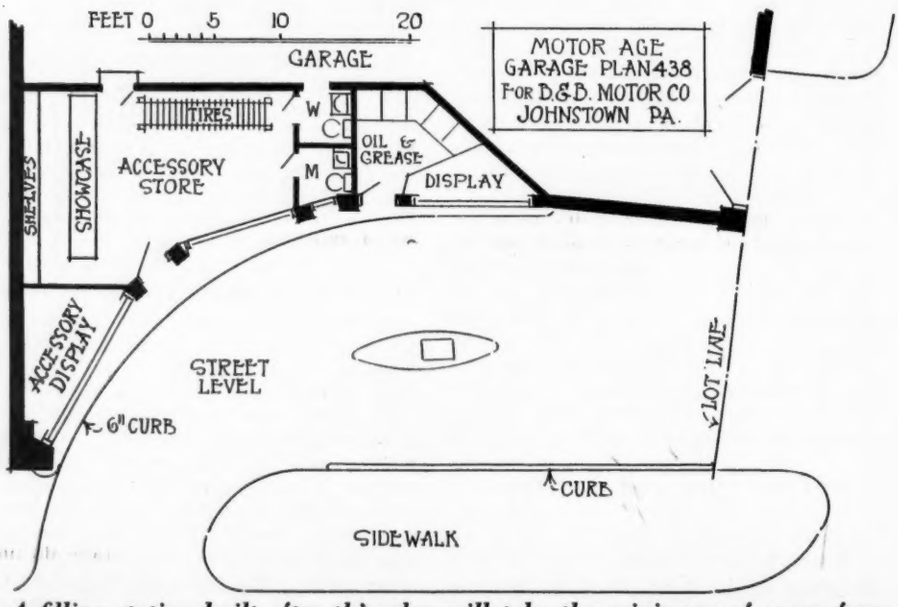
Since the corner where your front entrance is now located will be of little value for garage purposes, we suggest that you fit it up as an accessory and tire store to take advantage of the trade brought in by the filling station.

The roadway of the filling station should be about level with the sidewalk with a protecting curb 6 or 7 inches high next to the building. If the store floor is on this level or perhaps an inch higher to prevent water from blowing in, it will then take another step to get up to the garage floor.

There are numerous ways of building the front, one of which is shown in the retouched photograph. The roof could be left intact with a supporting post on the corner but we believe the light would be worth more than the shelter, especially if the store idea is used.

Before—Building on which suggestions for a front were asked

After—Motor Age design for filling station and accessories



A filling station built after this plan will take the minimum of space from the garage

Architectural Service

IN giving architectural advice, MOTOR AGE aims to assist its readers in their problems of planning, building and equipping, maintenance stations, garages, dealers' establishments, shops, filling stations, and, in fact, any building necessary to automotive activity.

When making request for assistance, please see that we have all the data necessary to an intelligent handling of the job. Among other things, we need such information as follows:

Rough pencil sketch showing size and shape of plot and its relation to streets and alleys.

What departments are to be operated and how large it is expected they will be.

Number of cars on the sales floor.

Number of cars it is expected to garage.

Number of men employed in repair shop.

And how much of an accessory department is anticipated.

RECOMMENDED TIMING FOR FORD CAMSHAFT

Q—Give the valve and piston timing that Ford uses for setting his valves with the piston.—C. L. Inman, Albany, Ala.

The opening and closing of the valves with relation to position of piston are as follows: Exhaust valve opens when the piston reaches 5/16 of an inch before bottom center, the distance from the top of the piston head to the top of the cylinder casting measuring 3⅜ in. Exhaust valve closes at top center of the piston or 5/16 in. above the cylinder casting. The intake valve opens 1/16 in. past top center or ¼ inch from top of cylinder to face of cylinder casting. The intake valve closes 9/16 in. past bottom center the distance from the top of the piston to the face of the cylinder casting being 3⅛ in. The exact point of opening or closing of the valve according to piston position may be determined by applying a twisting tension to the valve head with thumb and forefinger while turning the crankshaft over very slowly. While the valve is closed the fingers will be unable to turn the valve while at the opening point pressure between valve and seat will be relieved and the valve head may be turned easily with the fingers. The point of closing may be found in a similar manner. The tappet clearance should be not less than .022 and not more than .032. This data pertains to all Ford engines built after 1913. Previous to 1913 the timing distances were as follows: Exhaust valve opens ⅜ in. before bottom center. Exhaust valve closes 1/64 in. past top center. Intake valve opens 7/64 past top center. Intake valve closes ⅜ past bottom center.

BATTERY HELPS MAGNETO FOR EASY STARTING ON 1917 MAXWELL

Q—We would like information as to method of using storage battery on a 1917 Maxwell in connection with the magneto for easy starting. On this car it is easy to start it by using the hand crank but when using the starter the engine does not fire unless it is already warm.—City Garage, LaFontaine, Ind.

The Maxwell car in question is apparently one of the early 1917 models as later on the Atwater-Kent battery ignition system was used. With this type magneto it is impossible to use six volts from the storage battery as the storage battery is connected to ground and a ground cannot be used with the magneto. It is for this reason that dry cells are used, but if by accident these should become grounded or a ground should occur in one of the wires it would prevent operation of the system when using the starter switch as its operation also makes a connection from the dry cells through an inductance coil mounted near the magneto and then to the magneto winding. Two things will prevent the magneto from firing under these circumstances. One is a ground anywhere in the circuit of the dry cells while the other is a reverse connection either at the dry cells or at the magneto. To test for ground would suggest your removing both wires from the interrupter cover of the magneto and disconnecting the storage battery from ground. You can then step on the starter switch and nothing will happen due to the battery being disconnected. The circuit from the dry cells, however, should now be complete and you can test this by flashing the two small wires together which have just been removed from the magneto. If these give a slight spark it shows you have a good circuit from the dry cells and you should now try flashing first one and then the other to the frame of the car. If either one of them flashes it shows that your trouble is in a ground connection, but if neither one flashes then there is no ground and you should try reversing them in case the magneto does not give good spark as originally connected. There is fundamentally no reason why this system should not prove very satisfactory for easy starting and we believe you will find the trouble as above indicated. The reason that hand cranking gives satisfaction is that the starter switch is not operated and the dry cells are therefore not connected to the magneto so it works as an ordinary high tension magneto which will usually give a spark good enough for starting when spinning the engine.

The Readers' Clearing House

THIS department is conducted to assist dealers and maintenance station executives in the solution of their ploblems.

In addressing this department, readers are requested to give the firm name and address. Also state whether a permanent file of MOTOR AGE is kept, for many times inquiries of an identical nature have been made and these are answered by reference to previous issues.

Inquiries not of general interest will be answered by personal letter only. Emergency questions will be replied to by letter or telegram.

Addresses of business firms will not be published in this department, but will be supplied by letter.

Technical questions answered by B. M. Ikert, P. L. Dumas and A. H. Packer; Legal, by Wellington Gustin; Paint, by G. King Franklin; Architectural, by Tom Wilder; Tires, by a Practical Tire Man; General Business questions, by MOTOR AGE organization in conference.

INFORMATION REGARDING VIM TRUCK

Q—Do the foot and emergency brakes of the late Vim truck act upon the single internal brake band?

1—Although you do not state what model this truck is, we presume that you refer to the Model 29 or 30. On these trucks there are two brakes used on each wheel, the hand brake and foot brake, each having two brake shoes for their operation. It will thus be seen, that the emergency brake and foot brake do not work upon any single internal brake shoe.

2—How much mileage is it possible to obtain on a quart of oil? This truck has run about 5,000 miles.

2—We have been informed by the local Vim agency that model 29 or 30 will average about 50 miles per a quart of oil.

3—What is the bore and stroke? I believe the engine in question is a late 1921 model.—Carl H. Doden, Scranton, Pa.

3—The size of the engine in the model 29 and 30 which are the ½ ton models is 3⅛ x 4½. The size of the engine in the model 31 one ton truck is 3¾ by 5½.

UNSIGNED COMMUNICATION

Q—Will an engine receive any practical benefit from connecting the manifold to draw vapor from the crankcase and top of radiator? What would the effect in the combustion chamber be?—Novice, Houston, Texas.

We will be unable to answer this question through the columns of the Readers' Clearing House and would advise that Novice supply his name and address that we may answer this communication by letter.

STEERING GEAR ADJUSTMENT ON 1912 STUTZ

Q—In taking up the play on a Gemmer steering gear on a 1912 Stutz Bearcat is there any position for removing the end play in the cross shaft to which the bearing arm is attached?—W. W. Wilson, Lodge Grass, Mont.

1—There is no adjustment for removing the end play in the Gemmer steering gear on a 1912 Stutz Bearcat. In order to eliminate the end play it will be necessary to remove the steering gear from the car and the bushings which carry the cross shaft. The bushings and thrust pipe can be secured from the Gemmer Mfg. Co., Detroit, Michigan.

SOURCE OF REPAIR PARTS FOR AMERICAN LATHE

Q—Advise us if it is possible to obtain repairs for the American lathe—Newkirk's Garage, Ransom, Kansas.

Repairs parts for the American lathe may be secured from the Essley Machinery Co., 551 Washington Blvd., Chicago.

FORD PISTONS CAN NOT BE INSTALLED IN BUICK ENGINE

Q—We have a Buick model B-25, 1914, the bore is the same as the Ford. Could we fit the Ford light weight pistons to this engine?

1—The Ford light weight pistons cannot be used because of the fact that they have considerably more compression space than the Buick pistons.

2—If they won't fit will you give following dimensions of B-25 and Ford pistons: (a) the diameter of wristpin hole in piston, (b) the distance from top of piston to center of hole.—E. Langenberg, Peoria, Ill.

2—The distance from the center of piston pin hole to top of piston of the Ford piston is 1⅞ with a piston pin diameter of .740. The Buick 25 piston has a measurement from the center of piston pin hole to top of piston of 1 7/16 in. and a piston pin diameter of .740. In order to use the Ford pistons it would be necessary to raise the block 7/16 of an inch.

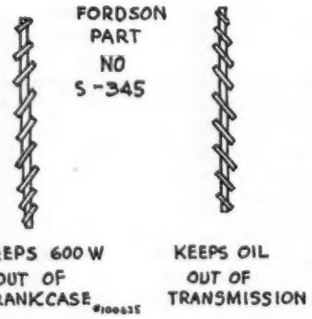
Overcoming Mixing of Lubricants in a Fordson Tractor

Q—We would like to know if there is any possible way of stopping the grease in the differential of a Fordson tractor from working through into the crankcase, and of keeping the oil in the crankcase from working back into the transmission.—A Reader.

1—Readers of this article are requested to refer to the Fordson Tractor Parts Price List, this article being written by referring to the one dated December 1, 1921. The pages to refer to are 12 and 13, page 13 being also plate No. 6, which shows a cut of the parts concerned. The mixing of lubricant referred to in the question takes place through part No. S-327, this being called tranmsission housing plate.

The large opening in the transmission housing plate carries the bearing No. S-351 and the bearing in turn carries the transmission drive shaft part S-335. The transmission housing plate oil shield No. S-345 is supposed to prevent the lubricant from working back and forth through the large opening in S-327. A possible explanation of the trouble referred to is in end play in the transmission drive shaft part No. S-335, which in working back and forth produces a sort of pumping action which in some cases allows the 600 W. to work forward into the engine and in some cases allows the oil to work back into the transmission.

In order to relieve the pressure or vacuum, whichever it is, which is formed in the transmission by this pumping action due to the slight end play, it is possible to remove the transmission cap screws just under the tool box and drill a 3/16 hole the full length of each cap screw as shown in the upper portion of sketch. This gives a sort of breather



pipe construction to the transmission and prevents the formation of either pressure or vacuum in it.

Another method of overcoming the trouble is to use from two to six of the transmission housing plate oil shields instead of the one which is specified.

Another method is to use one of these oil shields made into a sort of fan. This is done by cutting half-inch slits radially in one of these shields No. S-345, these slits being about ¼ in. apart all around the oil shield. The radial projections which are left by this process are then bent either one way or the other, depending on whether the tractor shows a tendency for the heavy lubricant to go forword or for the light oil to go into the transmission.

Sketch showing this construction is also given below. If the trouble has slowly developed as the tractor got older all parts that a visual inspection shows to be worn will have to be replaced. This usually includes parts No. S-351, S-327 and S-345. We are indebted for the material in this article to service engineers working with Ford dealers.

Knock Caused by Sticking Automatic Advance

Q—We have a 1920 Paige six equipped with Atwater-Kent ignition which incorporates both hand and automatic advance. We have recently had a peculiar condition of trouble with this car due to a knock which occurs when slowing down. When starting up, however, and when increasing the speed, the operation was normal. This knock had a peculiar sound unlike the usual knock caused by loose pins, rod bearings, pistons, etc. By removing the distributer cap it is possible to rotate the interrupter cam approximately 20 degs. and if the distributer cap is then replaced and the engine started the peculiar knock is reproduced. Is it possible for the automatic advance mechanism to stick while in the advance position and cause the trouble above described?—W. W. Bissell, Zearing, Iowa.

The operation of the Atwater-Kent automatic advance depends on centrifugal action of weights, which, flying out at high speed, have the effect of rotating the cam ahead of its normal position. As the device slows down again, however, the action of springs is supposed to return the weight. In the Atwater-Kent ignition units there is a place for oiling, this being accessible by lifting off the distributer cap, but many car owners do not know that such provision is made and, consequently, the automatic advance mechanism is in most cases neglected.

We would suggest your taking off the distributer cap and distributer arm and taking out the three screws which make it possible to lift off the whole interrupter assembly, including the condenser, after which you will be able to carefully inspect the automatic mechanism. By operating it by hand you can then readily determine whether the trouble is as above indicated and we believe that you will find that the weights operate with some friction, or that the springs are weak or perhaps both conditions will be present.

We believe that correcting the trouble will be better than trying to eliminate the operation of the automatic feature entirely, as it is our opinion that when properly installed and lubricated that it controls the spark much more accurately than the average driver is likely to do for he usually advances the spark to a certain point and then leaves it there regardless of whether he has throttled down to 12 m. p. h. or speeds up to 35 or 40.

Automatic Device on Hudson

2—Is it possible to remove the automatic device or set it so that it is non-operative on the Delco system used on a Hudson Super Six?

2—Our recommendation on this would be the same as on the Atwater-Kent system, for we believe the use of the automatic advance is very helpful and gives greater efficiency in operating the engine. If not operating properly the remedy is to correct the trouble rather than eliminate the device.

Straight Sides on Clincher Rims

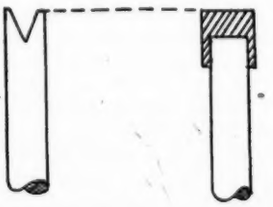
3—We have a number of tires on hand, straight side, which we would like to use on a car equipped with the old style Continental clincher rim. Is it possible to use a filler of some kind and where can this be purchased?

3—The straight side tires are built with a steel cable vulcanized in so that they are not capable of being stretched over the ordinary Continental rim. However, should the clincher type rim be one of those usually known as quick detachable, where one side or edge can be removed, then the straight side tires can be used by the employment of a filler. These can be purchased from some of the large tire jobbers, most any of them being able to supply your needs. However, on the rim such as used on Ford cars there is no use trying to make the installation for reasons above mentioned.

Valve Stems Drilled Too Deep

4—A set of valves and cages for a Chalmers Six were sent to a local machine shop to have the stems trued up and new bushings installed. The machinist who did the work drilled out the center holes at the end of the valve stems to such a point that the valve stem was weakened so that in service the clearance has to be adjusted every few miles. Would it be practical to fit light sleeves on the ends of the valve stems so as to project about ⅛ in. and cut fiber disks to fit inside of these for the rocker arm to make contact with?

4—We do not believe that fibre disks will be required, but would suggest that the valve stems be cut away to a place where the valve is solid so as to eliminate the part which has been weakened by the large center hole. Caps can then be made out of steel and so fitted that they will go on with a slight push or by tapping slightly. The valves can then be installed and the caps put in place and the adjustment made as previously.



Ammeter Burns Out

Q—What will cause the Ford ammeter to burn out? We started a car with the starter and the ammeter burned out. We then installed a new ammeter and it worked perfectly. The other ammeter that burned out had never given any trouble before burning out.

1—An ammeter will burn out due to excessive current through it which on the Ford car would be due to an accidental ground. The ground is caused wherever the insulation on the wire is rubbed off so that the wire itself can touch the frame of the car, or any metal part of the body or engine. Inasmuch as the new ammeter did not burn out, the trouble must have been of intermittent nature, although there is another slight possibility.

The ammeter is made of metal and is usually set in a metal dash or cowl board and if one of the terminals of the ammeter had become grounded by defective insulation, current might have been drawn through the ammeter winding and then to ground through the cowl board. As far as we can see this had no connection with the fact that you were operating the starter at that instant except that it produced slight vibration of the whole car which caused the circuit to ground at that particular time.

Sometimes when excessive current has been taken through a wire the insulation will smell burned or will show by its appearance that heavy current has been drawn. Also if the insulation is removed and the wire inspected it will be found to be black or blue instead of copper color. In this way you might be able to tell whether the ground had really been in the meter or in some part of the wiring.

Hole in Universal Ball Cap

2—The new model universal ball cap front for a Ford engine has a hole drilled in the bearing, although the same part on older Fords does not have any hole. Is this hole for the purpose of lubricating the bearing or to drain excess oil back into the transmission? Does the hole belong at the bottom or top?

2—The hole referred to should be at the top and is for the purpose of catching oil, as the flywheel, while liberally oiling the engine and front part of the transmission, does not scatter quite so much oil to the rear of the transmission.

Reads Charge Instead of Discharge

3—We installed new brushes in a Chevrolet 490 Auto-Lite generator. The brushes were put in the same way as the old ones. When we started the engine, however, the generator worked perfectly but the ammeter read 10 amperes discharge instead of charge. We reversed the wires on the ammeter and it now works all right. Explain the cause of this.—M. L. Cuthull, Swan Quarter, N. C.

3—Ordinarily you do not have to pay any attention to the charge and discharge marks on an ammeter, but if the reading on the meter increases as the engine speed increases, it shows the generator is charging. Ordinarily we would say that at the same time that you installed new brushes in the generator, you also took the battery out to have it charged and happened to get it in the reverse way. This, of course, is just a guess but is the only reason we know that would account for the change in ammeter reading.

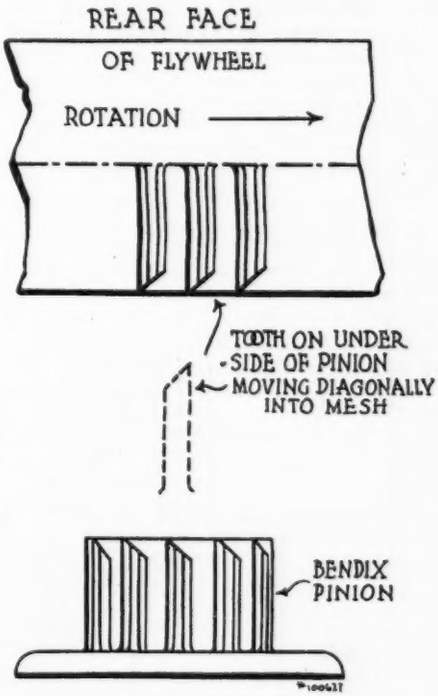
There is another faint possibility that at the time the generator was removed, the live wire coming from the ammeter was allowed to touch on the frame of the car, causing a short circuit or heavy rush of current through the ammeter. On some ammeters the construction is such that a heavy current may affect the magnetism in the permanent magnets and if this should be reversed it, of course, would account for the reversal in direction of reading.

The usual tendency, however, is merely to throw the needle off center as we do not recall having seen an ammeter reversed in this way, although we have seen some current indicators reversed by means of a very heavy current through them. The work that you did to the generator could in no way affect the rest of the circuit, for if the battery is left in and is properly connected you can always close the cut-out points and magnetize the generator so that it will charge.

STICKING BENDIX PINION AND METHOD OF CORRECTING THE TROUBLE

Q—We have a car on which the starter sticks. It will go along all right for variable periods, then all of a sudden when you step on the starter switch it will stick and have to be pried loose with a bar. How can this trouble be overcome and what is the cause?—A. Reader.

We assume that the car in question has a starter equipped with a Bendix drive and it is possible that the flywheel teeth have not been properly chamfered. Below is shown a sketch which indicates the usual method in which the Bendix is applied. At the upper part of the sketch is shown a portion of the flywheel, the teeth being on the side of the flywheel which is towards the front of the car. The operation of the Bendix drive is such as to not only rotate the pinion, but also slide it to the rear or into mesh with the flywheel.



The Bendix pinion tooth, which is shown dotted, is one which will be on the low side of the pinion and will be moving to the right in the sketch and also toward the flywheel. The direction of motion will therefore be indicated by the diagonal arrow showing that it is moving up and toward the right. This accounts for the necessity of putting all of the chamfer on one side of the tooth which gives very little possibility for the pinion tooth to hit on the end of the flywheel tooth and stick.

Where trouble of this kind has been experienced it is always well to carefully inspect the flywheel and see that the teeth are chamfered as shown. Slightly rounded corners of about 1/32 to 1/16 in. diameter are permissible as it is not necessary to have a knife edge on the corner of the tooth. The chamfering of the flywheel teeth is not an easy job but can be done with a sharp cold chisel and can also be done with a small electric motor, such as used for electric fans with small grinding wheel attached.

This can, in some cases, be inserted through the opening where the starter is taken off and some years ago the writer corrected this trouble on about a dozen cars in this manner. There is another possible cause of the Bendix pinion sticking even if the teeth are properly chamfered. This other cause is in too deep meshing of the pinion with the flywheel and can only be corrected by moving the starter so that the pinion will come farther out of mesh. This can usually be done by taking a round file and filing out the holes in the flange of the starter and also possibly by filing the opening in the flywheel housing through which the starter operates. In most cases a variation of 1/32 in the starter position will be ample to overcome the trouble if the teeth are properly chamfered.

USE OF KEROSENE NOT RECOMMENDED FOR AVERAGE AUTOMOBILE ENGINE

Q—We have a large car with a large engine, six cylinders 4½ by 6 are the dimensions. What would the difficulties be if I attempted to run this engine on kerosene, which I am contemplating doing as the gas consumption is almost prohibitive?—Robert E. Lee, care Carolina Motor Parts Co., Charleston, S. C.

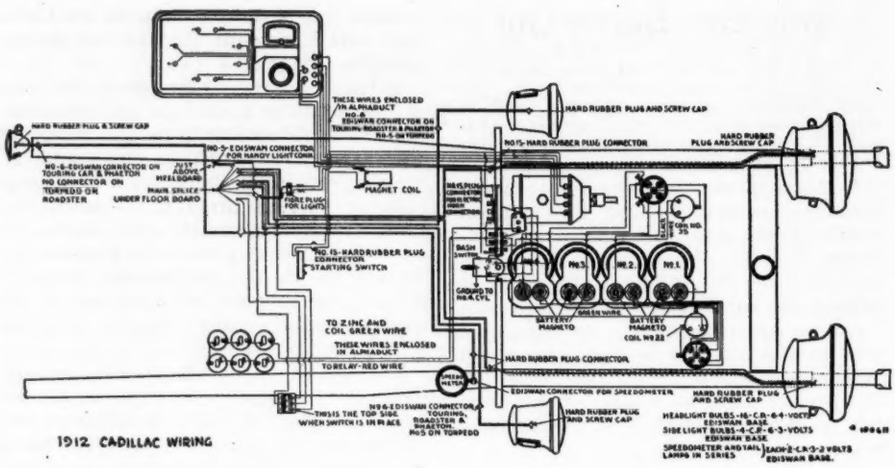
It will be necessary to secure a different gas distributing system if you wish to burn kerosene in this engine. This will require a different carbureter and probably a different manifold. In addition to the kerosene vaporizing equipment which will include the carbureter and manifold it will be necessary to have an auxiliary gasoline tank to use for starting the engine as it is impossible to start on kerosene.

There will be a tendency of the engine to knock under a pull and as the engine is not fundamentally designed to burn kerosene you probably will note considerable crankcase dilution. Taking all in all we seriously doubt whether the use of kerosene will really pay.

Battery Becomes Discharged in Few Days

Q—We have a Buick 1914 model B-25 which is giving considerable trouble as it frequently runs the battery down in from four days to a week. When new battery is put in it works all right, also when testing the charging rate we found it to be 10 amperes and when the engine was stopped there did not seem to be any discharge from the battery. At other times we have found the starter to crank the engine but the engine would not fire, then when using the crank we were able to start all right. At one other time neither the starter or ignition would work and the car had to be towed in.—J. S. Holladay, Rapidan, Va.

There is just one thing which will cause a good battery to become discharged and that is a ground in the wiring. On the Buick car in question the negative battery is grounded to the frame while the positive terminal of the battery is connected by a heavy cable to a large terminal at the side of the motor-generator. We would suggest your examining this cable carefully to see if at any point it rubs on the sharp corner of the frame of the car in such a way that the insulation may have been rubbed off. From your description we feel that whatever the nature of the trouble it is of intermittent character or in other words is not present all of the time. If this cable is obviously well insulated which can be determined easily by inspection we would then suggest your removing or disconnecting it from the motor-generator terminal so as to be ready to make a ground test. The ground test should be made with a 110 volt lamp line with a lamp connected in series with one of the wires, the other wire coming directly from the 110 volt socket. You will then have two test points which when touched together will light up the test lamp. One of these test points should be connected to the frame of the car and the other should be touched to the large terminal on the motor-generator remembering that the cable of the battery has been removed. If you now get the light which shows a ground, the trouble will be either in the series winding of the starting motor or in the cut-out points being closed or one of them grounded or in a ground in the leads going to the lighting switch or ignition switch. To see which place the ground might be it would be well to remove the other wire from the motor-generator, then if the lamp lights up when connection is made from this terminal to the ground it shows the trouble to be in the starting motor probably due to a ground in the field. When making this test it would be well to push on the field coil with a piece of wood or other object which will do no damage and try to move it a bit to see if the ground is obtained, as from your description the trouble has "come and go" characteristics which always give trouble to the electrician who is hunting for the cause. By disconnecting the wire from the motor-generator to the lighting switch and the ignition switch it will be possible to test this wire separately and also test the switch separately. Due to the fact that the trouble in the discharging of the battery is also accompanied by ignition trouble we would be inclined to suspect trouble in the ignition switch as it may be both grounded and also making poor connection at times. If you get the car in the condition where the starting motor is working and the ignition is not working would suggest your connecting an ammeter between the coil and the interrupter to see if the circuit is all right. If it is normal it will be noticed that the ammeter first registers four or five amperes and then drops back to zero, or if the engine is being cranked rapidly it may show a fluctuating reading to one or two amperes due to the rapid making and breaking of the circuit. If at any time the ignition circuit is carrying a current as shown by a reading as above described and you get no spark at the spark plugs it would indicate trouble either in the condenser or in the coil and it might be well to try a new ignition coil as we have known cases where ignition trouble was of intermittent character and sometimes the coil would be good enough to run the engine and sometimes it would fail to do so. Such trouble however would not account for the battery becoming discharged. We believe that you will discover the nature of the trouble in following the above suggestions but would be glad to hear the result of your test in any event.



WIRING OF 1912 CADILLAC

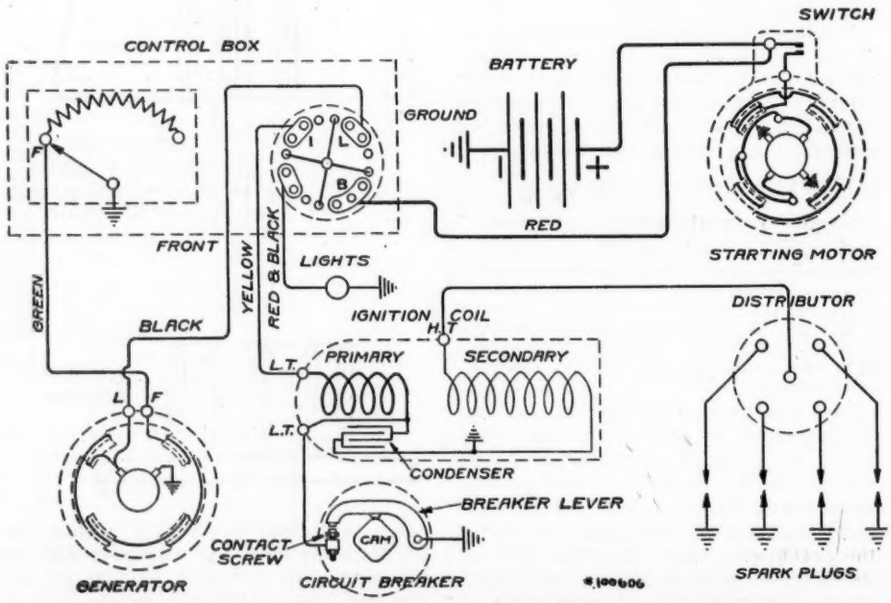
Q—Publish wiring diagram of the 1912 Cadillac equipped with a 24 volt system.—Rew Spatz, Meckling, S. D.

A diagram of this system is shown above.

SPECIAL REMY TRACTOR SYSTEM DIAGRAM

Q—Publish a complete wiring diagram of a Moline Universal tractor model D.—Lawrence Edwards, Sentinel Butte, North Dakota.

The diagram of the wiring system on this tractor is shown below. We would advise that you secure a Moline universal instruction book which very thoroughly covers instructions for adjustment of the governor used on the Remy system of this tractor.



Wiring diagram of Remy system on model D, Moline universal tractor

Timing Franklin Engine and Placing in Frame

Q—What is the position of the offset piston used in the Franklin touring car S-9B?

1—The pistons in the S-9B Franklin should be assembled with the hole in the skirt of the piston pointing to the exhaust side. That is, the hole in the piston skirt should be nearest the exhaust side of the engine.

Timing Franklin Engine

2—How is this engine timed?

2—Turn the flywheel ahead until No. 6 inlet valve just begins to open. At this point adjust No. 1 inlet valve walking beam or rocker so that the space between its screw and the valve stem is equal to the thickness of the spark plug gap feeler or 1/32 of an inch. Then place a piece of paper between No. 1 inlet valve stem and its walking beam adjusting screw and turn the flywheel ahead until the paper is just seized. At this point the mark "CL" 1-6 should be on the upper dead center of the flywheel.

The permissible variation is that the point may be ¾ in. advance or retarded from the center line mark. If the camshaft setting should be wrong remove camshaft gear and turn the flywheel so that the mark "CL" 1-6 is one inch ahead of the upper dead center; then replace the camshaft gear using the keyway which lines up best. When the camshaft gear is drawn on tight its angular cut teeth will retard the camshaft ½ in so that its setting will fall within the permissible limits of variation.

Oiling System on Franklin

3—Give best method of assembling and installing this engine in a frame, also outline the oiling system of this engine.

3—We assume that you are well acquainted with the procedure of installing the engine in the frame and are desirous of securing information as to the alignment of the engine with the transmission.

The following is advise by the Franklin Company. To align engine correctly remove the short universal shaft and attach a slender steel pointer onto the front universal joint flange of a clamp. Remove the spark plugs and crank the engine so that the pointer encircles the rear universal joint flange.

Failure of the pointer to run true with the edge of the flange will disclose any discrepancy in alignment. Vertical adjustment is made by shimming under the engine or transmission support rail; for horizontal adjustment by loosening the support rail sufficiently to allow the engine to be moved sideways slightly. Late series 9-B cars are not equipped with solid flanges consequently to make the above procedure applicable to these cars it will be necessary to use two Series 9-A flanges on the universal driveshaft flanges in place of the regular spider flanges.

The oil reservoir forms the bottom of the crankcase. It is an aluminum casting, the corrugated surface of which is exposed to the air so that the oil is constantly being cooled. A gear driven pump is housed in the walls of the oil reservoir and is connected to eight copper delivery pipes. The pump draws the oil from reservoir through a fine strainer and by means of a distributor that is a part of the pump forces the oil in predetermined drilled holes in the crankshaft to the connecting rod bearings from which it is thrown off by centrifugal force in a fine spray into the cylinders and onto all moving parts.

The starter chain and sprockets are oiled by a lead from the front main bearing. The timing gears are oiled by excess oil from the front main bearing. To prevent an excessive amount of spray from reaching the cylinder walls baffle plates are placed between the cylinders and the crankcase. The oil after lubricating all the surfaces is drained back to the reservoir and is then pumped over again through the same course. The amount of oil in the reservoir is indicated by a pointer on the oil intake pipe. It is always possible to know that the oil is feeding by observing the oil gage on the cowl board.

There are two adjustments for the oil pump each by a by-pass valve. One is the needle valve located in the center of the pump which regulates the amount of oil pumped to the bearings. The other is an automatic safety valve screwed into the pump at the second pipe opening from the rear and set so that the pressure cannot exceed 50 pounds. The oil going will operate with one pound pressure. To test the oil pump discharge from the engine run the engine at such a speed that the battery indicator just shows charge. Disconnect No. 4 and No. 5 pump leads and collect the discharge from them in a receptacle graduated so that ½ pint can be measured.

At this speed the oil from the two leads together should amount to ½ pint at the end of 200 spurts from one of the leads. The test should not be started until the engine is well warmed up. The needle valve is adjusted by screwing the valve stem in to increase the amount of oil pumped and screwing it out to decrease the amount. The approximate adjustment is ¼ of a turn open. If the pump is discharging too much oil see that by-pass valve is not stopped up.

This valve can be generally freed of dirt by removing the needle valve entirely and racing the engine. As soon as oil begins to flow from the needle valve opening the by-pass is clear. If the pump discharge is too little oil see if the by-pass valve is not open too much, also see if the automatic pressure relief valve is not binding. If the car has had a large amount of usage leakage may be occurring within the pump due to wear between the gears and housing.

Compensate for this wear by reducing the thickness of the bronze housing by applying fine emery cloth. Lay cloth on a smooth flat surface and be careful not to tip the housing while rubbing with the cloth. Do not make the pump too tight to turn freely with a screwdriver. Clean the oil pump and leads with a gasoline spray and examine for oil leaks every 5,000 miles.

Ford Factory Methods on Bearings

4—How are crankshaft and connecting rod bearings fitted in Ford engine at the factory. Are they line reamed or do they use the burning-in method.—O. Wright, Jackson, N. C.

The main bearings are bored in large lathe using boring bars, the cylinder being held in a jig, making use of the camshaft bearing holes as locating points. The bearings are bored to a diameter of 1,248 in. Boring bars are run through the bearings twice to insure a smooth and accurate job.

After the boring, the edges of the babbitt are fillited to a radius corresponding to that of the crankshaft bearings. After the cylinders receive the boring operation the bearing caps are removed and the .012 liners taken out. The edges of babbitt in the case bearings are now filed with a flat rasp to an angle of 45 degs. with the lower face of the case. The groove thus formed when the cap is assembled acts as an oil lead for the bearing and also has a clearance to take care of babbitt pressed out during the subsequent running in of the bearings. The ends of the bearings are also filed smooth, then the crankshaft is fitted in the case.

The crankshaft end play is determined by the variation between the length of the rear bearing and should not be more than .004 of an inch. The center and front bearings have from 1/32 to 1/16 of an inch end clearance which allows for expansion and lubrication. The caps are now rocked over the round shaft and two or more brass shims of .002 in. thickness are applied until the rock of the cap shows a .004 in. or .005 in. clearance between the case and cap edges.

Caps are then bolted down and the bearings are run in on a block at a speed of about 200 r. p. m. for the period of one minute. The bearings during this process are pressed to conform to the shaft and a smooth even contact between shaft and bearings is said to result.

The babbitt lined cap of the connecting rod bearings are assembled on the rods and the bearing is broached with .003 in. paper shims between the edges of shaft and rod before being assembled in the engine. .003 in. shims between connecting rod shank and cap are removed thus a tension between babbitt and crank bearing is produced when the cap is assembled which provides for the subsequent running in process of the bearing. The connecting rod caps are oiled and assembled on their respective connecting rods clamping around crank bearings. Bolts are tightened and locked with cotter pins. Engine is now placed on the block and run at 700 r. p. m. for about one minute. A connecting rod bearing which has been properly run in will be very hot after belting and this heat determines whether the bearing will pass inspection or not.

The pistons and rings are assembled onto the shaft during this burning-in operation.

Easy Starting With Magneto Ignition

How a Hot Spark Can Be Obtained at Very Low Speed With Various Types of Magnetos

MUCH has been said on the subject of hot-spots, chokers, etc., in connection with the carbureter for facilitating starting of the engine, but nothing that can be done to the carbureter will give perfect starting conditions if the spark of the ignition system is weak. With battery ignition a good spark is always obtained at low speed and with most magnetos the spark is also good, but under some circumstances as when cranking by hand or when the battery is low so that it does not permit the starter cranking the engine at very high speed some difficulty may be encountered in starting due to the weak spark which the magneto tends to give when turned over very slowly.

In Fig. 1 is shown a method of using battery and a coil which has one winding, an ordinary make and break ignition coil used on stationary engines being suitable for this purpose. Operation of the system shown in Fig. 1 is as follows: With the switch lever turned to the down or start position current from the battery will flow through the make and break coil and through the switch to the magneto and if the interrupter points are closed the current will return to the battery without flowing through the magneto winding.

As the engine is cranked however, and interrupter points open the current which has been flowing through the points will now flow through the primary winding of the magneto, this sudden rush of current being forced in by the make and break coil. This sudden current impulse will generate a spark in the magneto secondary which is connected by the distributer to one of the spark plugs.

As the engine fires and starts to run at a fair speed the voltage generated by the primary winding of the magneto will affect the action above described making the spark at two of the spark plugs stronger and killing the spark at the other two plugs. This is due to the fact that the storage battery gives direct current while the magneto gives alternating current and in one position of the armature the two currents co-operate to help the spark while in the other position of the armature the two currents operate to kill the spark.

The method above described is therefore not used commercially although there is no reason why it could not be used in an emergency if a magneto equipped car or truck has been overhauled and is very hard to crank so that it is practically impossible to spin it fast enough to get a spark from the magneto only.

Master Vibrators or Vibrating Starter Coils

At various times different concerns have put on the market starter coils designed to be used with high tension magnetos these being nothing more or less than electrically operated vibrators made somewhat on the principle of an electric door bell except that a condensor was used across the vibrating contact. Such a vibrator would be connected in place of the make and break coil shown in Fig. 1, and its action would be to vibrate with a very loud noise while the interrupter points were closed and to vibrate less vigorously when the interrupter points were open.

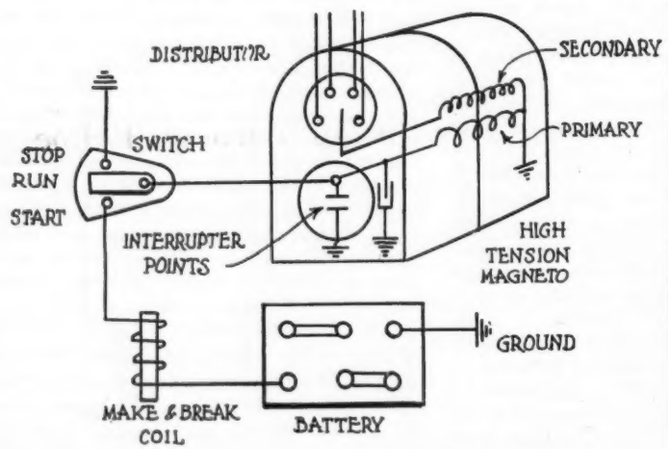
As the opening of the interrupter points times the spark, the impulses of current allowed to flow through the circuit by a vibrating starter coil would begin to go through the primary of the magneto just as the interrupter points open so that a shower of sparks would go to the spark plugs beginning with the firing position of the engine. Such devices are also somewhat affected by the voltage generated in the magneto.

The running position of the improvised switch shown in Fig. 1 is where no connections are made, the magneto being allowed to operate by itself. In the stop position where the switch lever is pushed to the up position the magneto interrupter is shorted out or grounded which kills the sparks at the spark plugs.

The Duplex High Tension Magneto

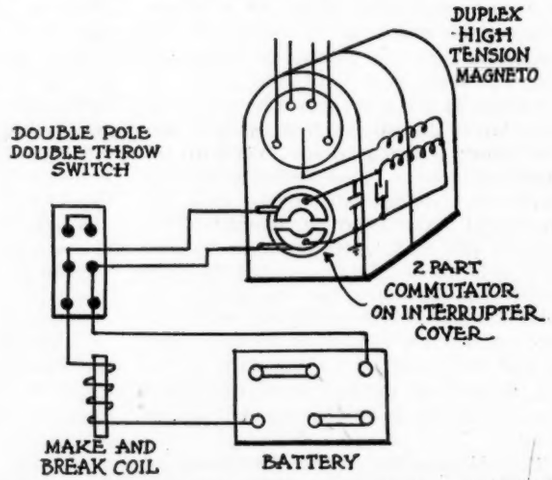
To overcome the difficulties experienced with the scheme shown in Fig. 1, various concerns have at times manufactured a high tension magneto in which a two-part commutator was built into the interrupter, such a magneto being shown in Fig. 2. This commutator has the function of reversing the connection between the magneto generated voltage and the battery voltage in between every spark so that if the battery helps to strengthen one of the sparks from the magneto it will strengthen all of them, while on the other hand if the battery is connected the wrong way instead of helping all the sparks it will kill all of the sparks.

The most common application of this principle was on the Maxwell cars which



BATTERY AND MAKE AND BREAK COIL IMPROVE SPARK FROM HIGH TENSION MAGNETO AT VERY LOW SPEED, 2 PLUGS WILL MISS AS ENGINE SPEED INCREASES.

Fig. 1


DUPLEX HIGH TENSION MAGNETO
DOUBLE POLE DOUBLE THROW SWITCH
2 PART COMMUTATOR ON INTERRUPTER COVER
MAKE AND BREAK COIL
BATTERY

THE DUPLEX HIGH TENSION MAGNETO IS BUILT TO HAVE ALL SPARKS HOT WHEN STARTING WITH BATTERY AND COIL.

Fig. 2

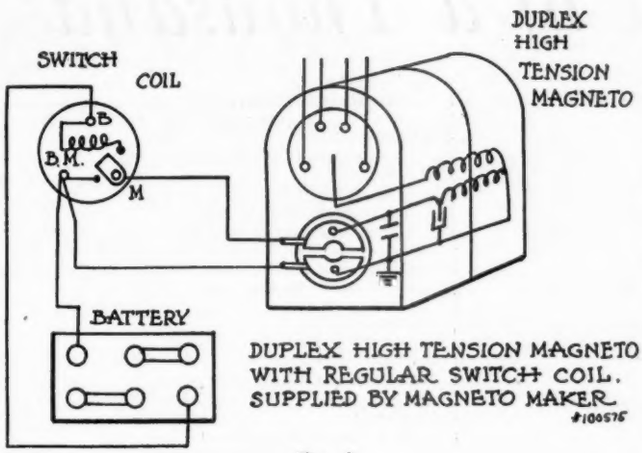


Fig. 3

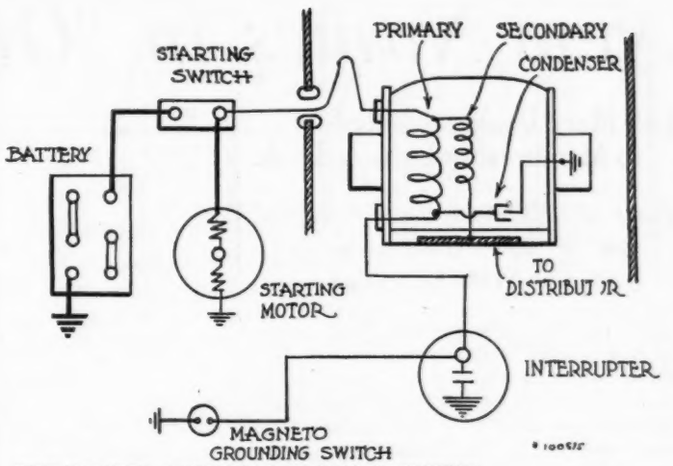


Fig. 4

used the Duplex magneto. If it should seem desirable to use this installation on a car equipped with a straight high tension magneto it might be possible to get a different interrupter in which the two rotating brushes are mounted and also get a new interrupter cover on which the two commutator segments are mounted. For example on a Bosch magneto this is the only change necessary to make the the straight high tension magneto into a Duplex high tension magneto.

The diagram of connections shown in Fig. 2, is more or less of a homemade proposition outside of the changes in the magneto itself. It has an ordinary double pole double throw switch as indicated which turned in the down position as shown allows the battery to increase the strength of the magneto spark. This same switch when open lets the magneto run as an ordinary high tension magneto while in the up position it shorts out the interrupter for stopping.

Duplex Magneto with Duplex Switch Coil

In Fig. 3 is shown a Duplex type of magneto connected up to a Duplex switch coil of the type usually furnished by the manufacturer. In this switch it will be seen that turning the switch lever which is pivoted at M to the up position will allow the battery to help the magneto. In the position shown the magneto runs as a straight high tension magneto while in the down position connection is made which will short out the magneto for stopping.

On Dixie type magnetos and on any magneto in which it might be possible to disconnect from ground the end of the primary winding which is ordinarily grounded a somewhat better scheme than any previously described is possible. In Fig. 4 the circuits of such a layout are shown. The coils in the Dixie magneto have a primary winding one end of which is normally grounded while the other end connects to the interrupter. In the sketch the normal ground which is at the top terminal as shown on the illustration has been removed and discarded and in its place the connection has been made to the motor side of the starting switch. To make this connection it was necessary to take off the sheet metal cover plate at the side of the magneto, bore a hole through it and bush the hole with a piece of fibre tubing so that the wire connecting the starting switch to the terminal of the coil could go through the side of the magneto without being rubbed by the cover plate.

The action of the magneto when running is now the same as before except that the coil gets its ground through the starting motor.

Battery Ignition Effect in Starting

When the driver of the car steps on the starting switch, it allows battery current to flow to the starting motor and back to battery, but as the starting switch also has a small wire connected to it a small amount of current will flow through the primary of the magneto winding and when the interrupter points close the circuit will be completed through the frame of the car and back to battery. Operation of the interrupter will then produce sparks which are supplied to the distributor, and this action is the same as in any battery system, the interference from the voltage generated by the primary of the magneto being apparently very slight.

When the engine starts and the driver takes his foot off the starting switch the starting motor stops and again serves as a ground connection. With this method the regulation grounding switch is also used for stopping. Magnetos are also constructed in which it is not necessary to make the change above described in the side cover plate of the magneto, as this lead instead of going directly to ground is brought down to another terminal on the cover of the interrupter.

The Impulse Starter

Another method of making a high tension magneto give a very hot spark in spite of slow engine speed is the use of an impulse coupling in which there is incorporated a spring and trigger. With the impulse coupling operating the first slight rotation of the engine merely winds up the spring as the trigger holds the the magneto armature from turning. When the natural firing point of the engine is reached in the retard position, the trigger is operated releasing the spring and allowing its stored energy to turn the armature or rotating portion of the magneto very rapidly thus producing a good spark. Devices of this kind are made by the various magneto companies and are either supplied with new magnetos or are supplied for installation on magnetos already in service.

These impulse starters are made in two general types, one of which has to be reset every time it operates while other types operate centrifugally and automatically go out of action above 300 or 400 r. p. m. of the engine and automatically start to work when the speed of the engine slows down, which prevents stalling of the engine due to weak spark when throttled down.

A careful consideration of the various methods above described is recommended to those who may be experiencing trouble in starting due to weak sparks from the magneto occasioned by low cranking speeds.

Tool to Draw Valve Stem Through Felloe

One of the difficulties of applying a clincher tire is to get the end of the valve stem through the rim and felloe of the wheel.

The tire beads frequently pinch the valve stem and hold it, and it is then necessary to remove the tube and cut small grooves in the beads at the position of the valve. To avoid this trouble, a special valve tool, made by adding a small wire or spoke to a valve cap, is an effective tool.

This special valve cap is screwed on the valve stem, and by means of the wire extension the valve is easily drawn through the felloe.

New Names in "One of a Thousand"

140 More Dealers Elected to Membership in N. A. D. A.

Total of 383 Have Been Accepted Out of 500 Applications in Nation-Wide Campaign

ST. LOUIS, July 8.—The third membership roster announced by the National Automobile Dealers' Association in its "One of a Thousand" campaign contains the names of 140 dealers who were elected to membership in June. This means a total of 383 members elected out of 500 applications received thus far. Names of those previously elected have already been published in MOTOR AGE. The third list follows:

ALABAMA

Birmingham
- Bissel Motor Co., Inc.

Mobile
- Standard Motor Car Co., Inc.

ARIZONA

Phoenix
- M. P. Barret, Inc.
- McArthur Brothers Merc. Co.
- Overland Arizona Co.

Tucson
- Snow & Tufts Auto Co.

ARKANSAS

Little Rock
- Bernstein Brothers.

CALIFORNIA

Los Angeles
- Ralph Hamlin, Inc.
- Howard Automobile Co. of L. A.
- Albert J. Russell.

Pomona
- Clark Brothers.
- Gates & Zander.
- C. R. May.

San Francisco
- H. O. Harrison Co.
- J. W. Leavitt & Co.

CONNECTICUT

Hartford
- The Harrington Hudson Co.

DISTRICT OF COLUMBIA

Washington
- Stanley H. Horner.
- Sterrett & Fleming, Inc.
- The Washington-Cadillac Co.

FLORIDA

Jacksonville
- Duval Motor Co.
- McCants Hall Co.
- Mangels-Kirby Co.
- Claude Nolan.
- E. C. Williamson Motor Co.

GEORGIA

Atlanta
- A. L. Belle Isle.
- Jos. G. Blount.
- Franklin Motor Car Co.
- J. W. Goldsmith, Jr.—Grant Co., Inc.
- John M. Smith Co.

ILLINOIS

Chicago
- Allison-Rood Co.
- W. C. Auble Motor Co.
- Dashiell Motor Co.
- W. V. Faunce Motor Co.
- Louis Geyler Co.
- James Levy Motors Co.
- Marmon Chicago Co.
- Rowe-Young-Cooley.
- Smith Sauer Motor Co.

Quincy
- Morris Adler Co.

KANSAS

Emporia
- Gunsolly Motor Co.

Hutchinson
- Clark Motor Co.
- The Davis & Child Co.
- Hereford Motors.
- Hutchinson Motor Car Co.

Parsons
- Kimball & Delay.
- J. C. Olson.

Salina
- Salina Automobile Co.

LOUISIANA

New Orleans
- Fairchild Motor Car Co.

Shreveport
- Geo. T. Bishop, Inc.
- Dickinson Motors, Inc.
- S. B. Hicks Motor Co., Inc.

MARYLAND

Baltimore
- H. S. Block.

MASSACHUSETTS

Greenfield
- The Weldon Garage, Inc.

Lawrence
- Smith Motor Car Co.
- Robinson-Toohey Co.

Springfield
- A. V. Reopell.
- J. S. Harrington, Inc.

New Bedford
- Auto Selling & Supply Co.

MICHIGAN

Detroit
- Bemb-Robinson Co.

Flint
- Dort Sales Co.
- Knight & Matzen.

MISSOURI

Springfield
- Central Motor Sales Co.

St. Louis
- Weber Motor Car Co.

NEBRASKA

Lincoln
- J. H. Markel.

Omaha
- J. H. Hansen Cadillac Co.
- O'Brien-Davis-Coad Auto Co.
- Scott Motor Car Co.
- Guy L. Smith.
- Stewart Motor Co.

NEW HAMPSHIRE

Manchester
- Manchester Auto Garage Co.

NEW JERSEY

Newark
- Mortensen & Humphreys, Inc.

NEW YORK

Buffalo
- Howard B. Smith, Inc.

New York City
- Stratton-Bliss Co., Inc.
- Warren-Nash Motor Corp.

Syracuse
- Ross Automobile Corp.

Rochester
- Alling & Miles, Inc.
- Chal-Max Motor Corp.

Cincinnati
- The Cincinnati Automobile Co.

Cleveland
- The Auburn Sales Co.
- Barnes Motor Co.
- Warner M. Bateman.
- Cleveland Cadillac Co.
- The Cleveland LaFayette Co.
- Cleveland Motor Car Sales Co.
- The A. L. Englander Motor Co.
- The Jordan Ohio Co.
- The Lake Erie Motor Co.
- Lucas & Christenson.
- The Marmon Cleveland Co.
- The Paige Ohio Co.
- Peerless Motor Co.
- The Simmons Motor Car Co.
- The Stearns Motor Sales Co.
- Stutz Motor Co.
- The Birkett L. Williams Co.

Dayton
- F. K. Boggs.
- The Citizens Motor Car Co.
- The Dayton Buick Co.
- The Jones Gist Co.
- The Welbon Dayton Motor Co.

Lima
- The D. D. Jones Co.

Springfield
- The Burke Motor Co.

OKLAHOMA

Ardmore
- Leachman-Johnson Motor Co.

Muskogee
- Cohenour Motor Co.
- Fast-Buck Motor Co.
- The Mills Motor Co., Inc.

Oklahoma City
- Markham Motor Co.
- Shelburne Motor Co.
- Vesper Motors Co.

Okmulgee
- Murdock Persels Motor Co.

Tulsa
- Southwest Nash Motor Co.

OREGON

Portland
- C. L. Boss Automobile Co.

PENNSYLVANIA

New Castle
- Smith-Foster Motor Car Co.

New Salem
- Coffman Motor Co.

Pittsburgh
- Eddie Bald Motor Car Co., Inc.
- Samson Motor Co.
- Frank D. Saupp, Inc.

Sharon
- Electric Garage.

TEXAS

Amarillo
- Toney Chisum.

Brady
- F. R. Wulff Motor Co.

El Paso
- Lone Star Motor Co., Inc.

Fort Worth
- Percy Garett Motor Co.

Galveston
- Jno. Christensen & Co.

Houston
- A. C. Burton & Co.
- Gydeson-Manford Cadillac Co.
- Morehart & Kelley Auto Co.
- Oldsmobile Sales Co., Inc.
- Shelor Motor Co.

San Antonio
- Birdsong & Patchernick.
- Citizens Auto Co.
- Crockett Automobile Co.
- Guarantee Motor Car Co.
- Jack Neal-Nash Motors Co.
- San Antonio Cadillac Co.
- Universal Car Co.
- Winerich Motor Sales Co.

VIRGINIA

Norfolk
- William F. Lintz

Richmond
- Anderton Auto Co., Inc.
- Jones Motor Car Co.

Roanoke
- Virginia Motor Car Co., Inc.

WASHINGTON

Yakima
- Washington Auto Co., Inc.

TO BEGIN FORD BEARING PLANT

DETROIT, July 7—Construction of the Ford Motor Co.'s ball and roller bearing plant at Green Island, Troy, N. Y., will be started in July, according to present plans of the company. One building will be erected one story high, 1,100 ft. long and 120 ft. wide. If later buildings are erected they will be duplicates of the first, paralleling space being allowed under present plans. By confining operations to one building the company aims to attain higher production efficiency and economy. Power for the plant will be furnished by the Hydro Electric Plant, recently completed and tested at maximum capacity. This plant will generate 8,000 horsepower, all of which will be used when the plans of the company are fully matured.

COMING MOTOR EVENTS

AUTOMOBILE SHOWS

Columbus, O.	Columbus Auto Dealers Co.	Aug. 28-Sept. 3
Indianapolis	Indianapolis Automobile Trade Assn.	Sept. 4-9
Wilmington, Del.	Delaware State Fair	Sept. 4-9
Hartford, Conn.	Connecticut Fair Grounds	Sept. 4- 9
Spokane, Wash.	Annual Show	Sept. 4-9
Chicago	Annual Show of the Automotive Equipment Association	Nov. 13-18

RACES

Tacoma, Wash.	Eleventh Annual Race	July 4
Strasbourg	French Grand Prix	July 15
Colo. Spgs., Colo.	Pike's Peak Race	Sept. 4
San Carlos, Cal.	500-Mile Armistice Day Race	Nov. 11

FOREIGN SHOWS

Berlin	Kaiserdamm Hall	Sept. 25-Oct. 3
Rio de Janiero	Automotive Exhibition	Sept., 1922
London	International Commercial Vehicle Exhibition	Oct. 12-13
Paris, France	Automobile Show	Oct., 4- 15
London	Annual Show	Nov. 3-11

CONVENTIONS

Olympia	Washington Automotive Trade Assn.	July 21-22

300 Buick Dealers to Meet In Yellowstone National Park

MINNEAPOLIS, July 7—Buick dealers in the territory of the Pence Automobile Co. of Minneapolis will gather this year in Yellowstone National Park, where they will have their annual summer conference and outing Aug. 7, 8, 9, 10 and 11. This trip west is an innovation, as for the past nine years or so the Pence Co. has engineered at least four lake boat trips and three special train trips to the factory at Flint, Mich. This year 300 dealers will join their Montana brethren on their home ground, and they will inspect all the 1923 models there, instead of at the factory, as heretofore, and several factory officials will journey out to take part in the discussions.

Besides two or three men from the engineering force there will be present President H. H. Bassett of the Buick Motor Co., General Salesmanager E. T. Strong, Wade H. Leach of the sales department at Flint, and President and General Manager W. L. Day of the General Motors Truck Co. As usual the excursion will be personally conducted by W. R. Stephens of the Pence Co.

Distributor Succeeds Maxwell-Chalmers Branch in New York

NEW YORK, July 1—Colt-Stewart Co. has been formed in New York City by William L. Colt and William D. Stewart to take over the distribution of Maxwell and Chalmers cars in the New York territory. Aside from the importance of the men composing the new company, the change is important also in that it marks the discontinuance in New York of the former Maxwell-Chalmers branch and places their business in the hands of a distributor.

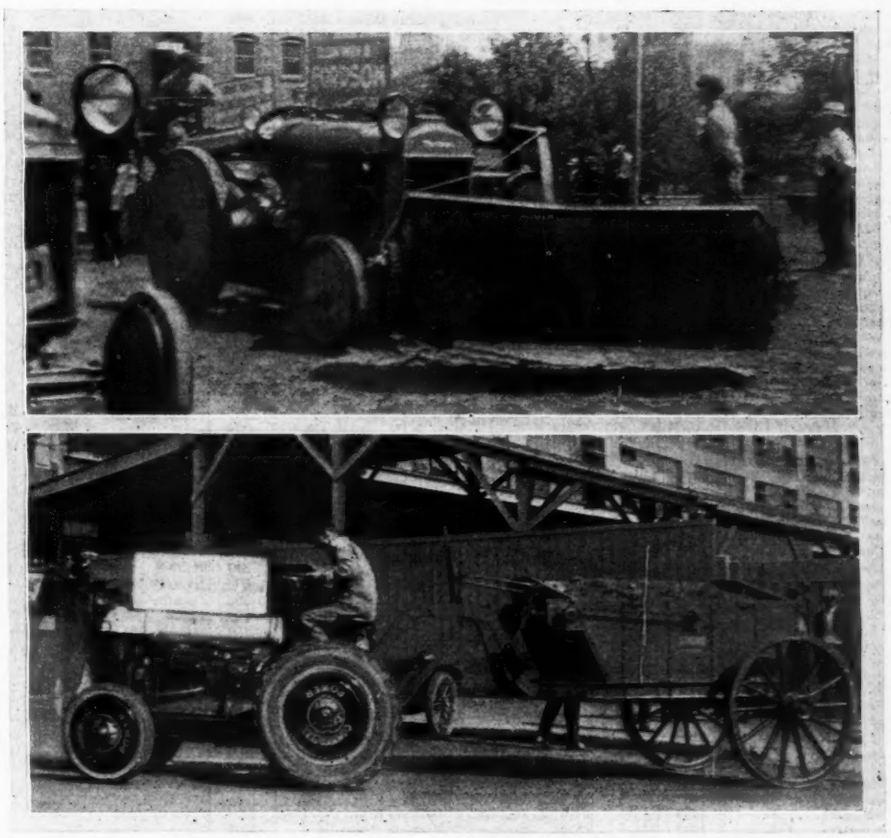
DEALERS AID IN CONVICTIONS

ST. LOUIS, July 8—The St. Louis Automobile Dealers' Association and the St. Louis Safety Council have awarded cash prizes to Officer Peter J. Nolan and George Sherwood of the St. Louis Automotive Corporation for the parts they took in the conviction of Walter Heuer, who feloniously left the scene of an automobile accident on Dec. 30, last, which resulted in the death of Mrs. E. Stillwell. Heuer was fined a $100 and sentenced to 30 days in jail by a jury last week. The dealers and the Safety Council have a standing offer of $100 each to persons who cause the arrest and conviction of any one who feloniously leaves the scene of an automobile accident.

ST. LOUIS DEALERS' PICNIC

St. Louis, July 10—The second annual picnic of the St. Louis Automobile Dealers' Assn. will be held Thursday, July 20, at Lake Hill Park. The picnic will be for all employes and persons connected with the various establishments. It is planned to have all dealers close their establishments on the day of the picnic.

Industrial Uses of Tractors Shown at Omaha



OMAHA, Neb., July 7—A very successful demonstration of Fordson tractors under the auspices of Fordson dealers in this territory was held here last week and was attended by about 25,000 persons. Twenty-five sales were made at the show and a list of 5,000 prospects was compiled.

There were between 35 and 40 tractors in operation continuously each day of the demonstration. As at the demonstrations held at Kansas City and elsewhere many industrial uses of the tractor, in addition to agricultural uses, were demonstrated. Tractors were shown operating stone crushers, street sweepers, steel shovels, dump trucks and other equipment.

Specifications of Current Motor Truck Models

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES Front	TIRES Rear	Final Drive
Acason	¾-1	$1650a	3¾x5	34x5n	34x5n	W
Acason....RB	1½	1950	3¾x5¼	36x3½	36x6	W
Acason....H	2½	2750	4⅜x5¾	36x4k	36x8k	W
Acason....L	3½	3450	4⅜x5¾	36x5k	36x10k	W
Acason....M	5	4350	5 x6¼	36x6	40x12	W
Ace	1½	2295	3¾x5½	34x3½k	34x5k	W
Ace....A	2½	2795	4¼x5½	36x4k	36x7	W
Acme	1	....	3¾x5	35x5n	35x5n	W
Acme....30	1½	....	3¾x5	34x3½	34x5	W
Acme....40	2	....	3¾x5	34x3½	34x5	W
Acme....60	3	....	4½x5¼	36x4	36x7	W
Acme....60L	3	....	4½x5½	36x4	36x7k	W
Acme....90	4½	....	4½x5½	36x5	40x10	W
Acme....125	6¼	....	4¾x6	36x6	40x12	W
American	2½	3350	4 x6	36x4k	36x4dk	W
American....40	4	4275	4½x6	36x5k	36x5dk	W
Armleder	1	2350	3¾x5¼	34x3½k	34x5k	W
Armleder....21	1½	2425	3¾x5¼	34x3½	34x6	W
Armleder....40	1½	2850	4½x5¼	34x3½	36x6	W
Armleder....HW	2½	3200	4¼x5½	36x4k	36x7k	W
Armleder....KW	3½	4150	4½x6	36x5	36x5d	W
Atlas....MD	1	1185	3½x5	32x4½n	32x4½n	W
Atterbury	¾-1	2475	3¾x5	34x3½	34x5	W
Atterbury....7CX	2½	3175	4½x5¼	36x4	36x4d	W
Atterbury....7D	3½	3975	4½x5½	36x5	40x5d	W
Atterbury....8E	5	4975	4¾x6	36x5	40x6d	W
Autocar	1½-2	1950	4¾x4½t	34x4k	34x5k	D
Autocar....21UG	1½-2	2050	4¾x4½t	34x4k	34x5k	D
Autocar....27H	2	2950	4 x5½	34x5	36x7	D
Autocar....27K2	2	3075	4 x5½	34x5	36x7k	D
Autocar....26Y	5	3950	4½x5½	34x6	36x12	D
Autocar....26-B	5	4100	4½x5½	34x6	36x12	D
Available....H1½	1½	2475	4 x5	36x3½k	36x5k	W
Available....H2	2	2775	4 x5	36x3½k	36x6k	W
Available....H2½	2½	3160	4 x5	36x4k	36x8k	W
Available....H3½	3½	4175	4½x5½	36x5	40x5d	W
Available....H5	5	5375	5 x6	36x6	40x12	W
*Avery	1	...	3 x4s	34x5n	34x5n	1
Beck....A Jr.	1½	1285a	3½x5	32x4½n	32x4½n	1
Beck....B-30	1½	2050	3¾x5	34x5	36x6	
Beck....C-40	2	2150	3¾x5	36x6	36x6	
Beck....D-50	2½	2850	4½x5¼	38x7	40x8	
*Bell....(Penn.)	½	1000a	3½x5	31x4n	31x4n	B
Bell....M (Iowa)	1	1495	3⅝x5½	35x5	35x5n	W
Bell....E (Iowa)	1½	2100	3¼x5½	34x3½	34x5	1
Bell....O (Iowa)	2½	2550	4½x5½	34x4	34x6	1
Belmont....A	½	725	3¾x4½	31x4	31x4	B
Belmont....D	2	2575	4¼x5½	34x3½k	34x6k	1
Belmont....F	3	3500	4 x6	36x5k	36x5dk	1
Bessemer....G	1	....	3½x5	35x5n	35x5n	1
Bessemer....H-2	1½	....	3¾x5	36x3½	36x5	1
Bessemer....J-2	2½	....	4⅛x5¼	36x4	36x4d	1
Bessemer....K-2	4	....	4½x5½	36x5	36x10	1
Bethlehem....KN	1	1195	3½x5	34x4½n	35x5n	B
Bethlehem....CN	2	1505	4 x6¼	34x4½k	34x6k	1
Bethlehem....HN	3	2195	4 x5¼	36x4k	36x8k	1
Brinton....C	1½	1500	3¾x5	34x4	34x5	W
Brinton....D	2½	2250	4½x5¼	36x4	36x7	W
Brockway....E	1	....	3¾x5½	35x5n	35x5n	B
Brockway....S-5	1½	....	3¾x5	36x3½k	36x5k	W
Brockway....SK	1½	....	4½x5¼	36x4	36x6	W
Brockway....KR	2½	....	4½x5½	36x4	36x8	W
Brockway....K-5	2½	....	4½x5¼	36x4	36x8	W
Brockway....RT	3½	....	4¾x6	36x5	36x10	W
Brockway....R-4	3½	....	4½x5½	36x5	36x5d	W
Brockway....T-4	5	....	4¾x6	36x6	40x6d	W
*Buick	...	945b	3⅝x4¾	31x4n	31x4n	B
Capitol....G	1½	2975	3¾x5	35x5	38x7	W
Capitol....H2½	2½	3700	4¼x6	36x4	36x8	W
Capitol....K2½	2½	4250	4¼x6	36x6	42x9	W
Capitol....M3½	3½	4425	4½x6	36x5	36x10	W
Case	2	....	4¼x5¾	36x6	38x7	1
*Chevrolet....G	¾	745	3⅛x4	31x4n	34x4½n	B
*Chevrolet....T	1	1125	3⅛x5¼	33x4n	35x5n	W
Chicago....C1½	1½	....	4 x5	36x3½k	36x5k	W
Chicago....C2½	2½	....	4 x5	36x4k	36x7k	W
Chicago....C3½	3½	....	4½x5½	36x5	36x10	W
Chicago....D5	5	....	4½x5½	36x6	40x12	W
Clydesdale....10	¾-1½	1485	3¾x5	34x5n	34x5n	B
Clydesdale....18	¾-1½	1890	3¾x5	34x5	34x5	W
Clydesdale....20	1-1½	2385	3¾x5	34x5	34x5k	W
Clydesdale....42	1½-2	2475	3¾x5	36x3½	36x6	W
Clydesdale....6SX	2½-3	3250	4½x5¼	36x4	36x8	W
Clydesdale....6SEX	2½-3	3150	4½x5½	36x4	36x8	W
Clydesdale....90	3½-4½	4100	4½x5½	36x5	36x10	W
Clydesdale....120	5-6	4500	4¾x6	36x6	40x12	W
Columbia....H	1½	1895	4 x5	35x5	38x7n	1
Columbia....G	2½	2335	4 x5½	36x4	36x7	1
Comet....T	1½	1950	3¾x5	34x4	34x4	W
Commerce....T	¾-1½	1450	3¾x5	34x3½n	34x4½n	B
Commerce....12	1½	1800	3¾x5	35x5n	35x5n	1
Commerce....16	2	2150	3¾x5	35x5n	36x6	1
Commerce....18	2½	2495	4½x5¼	36x6n	36x7n	1
Commerce....25	2½	2425	4½x5¼	36x4	36x7	W
Cook....51	2½	3600	4 x5⅛	36x6n	40x8n	W
Corbitt....E-22	1	1480	3¾x5	34x3½	34x4	W
Corbitt....D-22	1½	2200	3¾x5	34x3½	34x4	W
Corbitt....C-22	2	2600	4½x5¼	36x3½	36x6	W
Corbitt....B-22	2½	3000	4½x5¼	36x4	36x7	W
Corbitt....R-22	3	3200	4½x5½	36x4	36x8	W
Corbitt....A-22	3½-4	3800	4½x5½	36x5	36x10	W
Corbitt....AA-22	5	$1500	4¾x6	36x6	40x6d	W
Day-Elder....AS	1	1600	3¾x5	35x5n	35x5n	W
Day-Elder....B	1½	2000	3¾x5	34x3½	34x5	W
Day-Elder....D	2	2400	4½x5¼	36x4	36x7	W
Day-Elder....C	2½	2750	4¼x5½	36x4	36x7	W
Day-Elder....F	3½	3150	4½x5½	36x5	36x5d	W
Day-Elder....E	5	4250	4½x6	36x5k	40x6dk	W
Dearborn....E	1	1600	3⅝x5⅛	35x5n	35x5n	W
Dearborn....FX	1½	2300	3¾x5½	34x4	34x5	W
Dearborn....F	1½	2180	3¾x5½	34x4	34x5	W
Dearborn....48	2	2590	3¾x5½	34x4½n	34x7	W
Defiance....G	1	1695a	3¾x5	35x5n	35x5n	B
Defiance....D	1½	2095a	3¾x5	35x5n	36x6n	1
Defiance....E	2	2275a	3¾x5	35x5n	38x7n	B
Denby....31	1½	1485	3½x5	35x5n	35x5n	B
Denby....33	1½	2145	3¾x5	35x5n	38x7n	1
Denby....34	2	2395	3¾x5	36x3½	36x6	1
Denby....35	2½-3	2795	4½x5¼	36x4	36x7	1
Denby....27	4	3895	4½x5½	36x5	36x5d	1
Denby....210	5	4295	4½x5½	36x6	40x6d	1
Dependable....A	¾-1	1650	3⅝x5½	34x5n	36x6n	W
Dependable....C	2	2350	3¾x5½	34x3½	34x5	W
Dependable....D	2½	2650	4 x5½	34x5	36x6	W
Dependable....E	3	2950	4¼x5½	36x4	36x7	W
Diamond T....O-8	1-1¼	1975	3¾x5¼	36x3½n	36x4n	W
Diamond T....T	1½	2250	3¾x5¼	36x3½	36x5	W
Diamond T....U	2-2½	2650	4 x5¼	36x4	36x7	W
Diamond T....K	3½	3750	4¼x5½	36x5	36x5d	W
Diamond T....EL	5	4325	4½x5½	36x6	40x6d	W
Diamond T....S	5	4500	4¾x6	36x6	40x6d	W
*Diehl....A	1	....	3½x5	34x4½	35x5	1
Diehl....B	1½		3½x5	36x6	36x6	1
Doane	2½	4100b	4¼x5¾	36x5	36x7	C
Doane	3½	5100b	4⅝x5¾	36x5	36x5d	C
Doane	6	6000b	5 x6¼	36x6	40x6d	C
*Dodge Brothers	½	730	3⅞x4½	32x4n	32x4n	B
Dorris....K-4	2-2½	3400	4¼x5½	36x4	36x7	W
Dorris....K-7	3½	4400	4¼x5½	36x5	36x10	W
*Dort	½	685a	3½x5	31x4n	31x4n	B
Double Drive....B	3	4000	4¼x5½	6	6	W
Duplex....A	2	2775	4 x5¼	35x5n	38x7n	W
Duplex....E	3½	3500	4¼x5½	36x8	36x8	1
Duty	2	1590	3½x5	34x3½	34x5	1
Eagle....101	1½	1875	3⅝x5⅛	34x5	34x5	1
Eagle....100-2	2	2275	3¾x5¼	34x4k	34x7k	1
F. W. D.	B	3	4200	4⅜x5½	36x6	36x6	B
Fageol	1½	1½	3000	3¾x5¼	34x3½k	34x6k	W
Fageol	2½	2½	3900	4¼x5¾	34x4	36x7	W
Fageol	3½	3½	5000	4½x6¼	36x5k	40x5dk	W
Fageol	5	5	5700	4½x6¼	36x6	40x6d	W
Fargo	R	2	1700	3¾x5	36x4	36x6	1
Federal	SD	1½	1800	3¾x5	35x5n	36x6n	W
Federal	TE	1½	2175	4½x5¼	36x3½	36x5	W
Federal	UE	2-2½	2425	4½x5¼	36x4	36x7	W
Federal	WE	3½-4	3150	4½x5½	36x5	36x5d	W
Federal	X2	5-6	4500	4¾x6	36x6	40x6d	W
*Ford	TT	1	430	3¾x4	30x3½n	32x4½n	W
Front Drive	C	1½	2800	3¾x5½	5	4	W
G & J**	20	1	2275	3⅝x5½	34x5n	34x5n	W
G & J**	A	2-2½	3375	4x5¼	36x4	36x7	W
G & J**	B	3½-4	4475	4½x5½	36x5	36x10	W
G.M.C.	K16	1	1295	3½x5½	34x5n	34x5n	B
G.M.C.	K-41A	2	2375	4 x5½	36x4k	36x7k	W
G.M.C.	K-41B	2	2375	4 x5½	36x4k	36x7k	W
G.M.C.	K-71A	3½	3600	4½x6	36x5	40x5d	W
G.M.C.	K-71B	3½	3700	4½x6	36x5	40x5d	W
G.M.C.	K-101A	5	3950	4½x6	36x5	40x6d	W
G.M.C.	K-101B	5	4050	4½x6	36x5	40x6d	W
G.W.W.		1½	1850	3¾x5½	35x5	35x5	1
*Garford	15	¾	1590	3⅝x5½	34x5n	34x5n	W
Garford	25-B	1¼	1990	3¾x5½	36x6n	36x6n	W
Garford	70-H	2	2750	4½x5½	36x4	36x7	W
Garford	77-D	3½	3750	4½x6	36x5	36x6d	W
Garford	68D	5	4500	5 x6¼	36x6	40x6d	W
Garford	150-A	7½	5200	5½x6	36x6	40x7d	C
Gary	F	1-1½	1675	3¾x5	36x3½	36x4	W
Gary	I	2	2250	4 x5½	36x3½	36x6	W
Gary	J	2½	2650	4¼x5½	36x4	36x8	W
Gary	K	3½	3650	4½x6	36x5	40x5d	W
Gary	M	5	4100	5 x6¼	36x6	40x6d	W
Gersix	M	1½	3100	4 x5½	36x3½	36x7	W
Gersix	K	2½	3500	4½x5½	36x4	36x8	W
Gersix		3½	4500	4½x6	36x5	40x12	W
Graham Bros.		1	1265	3⅞x4½	33x4½n	34x5n	B
Graham Bros.		1½	1325	3⅞x4½	33x4½n	36x6n	B
1Gramm-Pion.	10	1	1365	3½x5	33x5n	33x5n	B
1Gramm-Pion.	15	1½	1900a	3¾x5	36x3½k	36x5k	1
1Gramm-Pion.	65	1½	2500a	3¾x5	36x3½k	36x5	W
1Gramm-Pion.	20	2	$2025a	4½x5¼	36x4k	36x7k	W
1Gramm-Pion.	30	3	3275a	4¼x5½	36x4k	36x4dk	W
1Gramm-Pion.	75P	3½	4225a	4½x5½	36x6n	42x9n	W
1Gramm-Pion.	40	4	3995a	4½x5½	36x5	36x5dk	W
1Gramm-Pion.	50	5-6	4895a	4¾x6	36x6	40x6dk	W
Hahn....B2	1	....	3½x5	34x5k	34x5k	W
Hahn....O	1½	....	3¾x5½	36x3½k	36x6k	W
Hahn....K	2	....	4¼x5½	36x7k	36x8k	W
Hahn....L	3	....	4½x5½	36x5k	36x8k	W
Hahn....M	5	....	4½x6	36x5	36x10	W
Hahn....N	6	....	4½x6	36x6	40x12	W
Hal-Fur....E	1½	2350	4x5½	34x5n	38x7n	W
Hal-Fur....B	2½	3000	4¼x5½	36x6n	36x8	W
Hal-Fur....F	3½	4000	4½x5½	36x6n	40x10	W
Hall....1½	1½	3100	3¾x5	34x5n	38x7n	W
Hall....2½	2½	3275	4⅜x5¼	36x4	36x6	W
Hall....3½	3½	4100	4½x5½	36x5	36x5d	W
Hall....5	5	5100	4½x5½	36x5	40x6d	W
Hall....7 chain	7	5100	4½x5½	36x5	40x6d	C
Harvey....WOA	2	2650	4¼x5½	34x4	34x7	W
Harvey....WFA	2½	2950	4¼x5½	36x4	36x7	W
Harvey....WHA	3½	3050	4½x6	36x5	36x5d	W
Hawkeye....K	1½	1850	3¾x5½	34x3½k	34x5k	1
Hawkeye....M	2	2650	4¼x5	36x4k	36x6k	1
Hawkeye....N	3½	3700	4½x6¾	36x5k	36x10k	1
Hendrickson....O	1½	2200	3⅝x5½	36x4n	36x5n	W
Hendrickson....N	2½	2690	4¼x5¾	36x4k	36x7k	W
Hendrickson....M	3½	3000	4¾x5	36x5k	36x5dk	W
Hendrickson....K	5	4000	5 x6¼	36x6	40x6	W
Huffman....B	1½-2	1795	3¾x5	34x3½	34x6	W
Huffman....C	1½-2	1635	3¾x5½	36x3½	36x6	1
Huffman....D	2-3	2895	4¼x5½	36x4	36x7	
Hurlburt....A	1½	2850	4 x5½	34x4	34x5	W
Hurlburt....B	2½	3750	4¼x5½	36x4	36x4d	W
Hurlburt....C	3½	4590	4½x6	36x5	36x5d	W
Hurlburt....D	5	5500	4½x6	36x5	40x6d	W
Indep'd't(Iowa), B	1	1665	3½x5	34x3½	34x4	1
Indep'd't(Iowa), G	1½	2040	3¾x5½	34x3½	34x5	1
Indep'd't(Ia.), H	2½	2940	4½x5¼	36x4	36x4	1
Indep'd't(Ohio), F	2½	2385	3¾x5	36x3½	36x5	W
Indep'd't(Ohio), H	2½	3085	4½x5¼	36x4	36x4d	W
Indep'd't(Ohio), K	3½	3985	4½x5½	36x5	36x5d	W
Indiana....12	1½	....	3¾x5¼	34x3½k	34x5k	W
Indiana....20	2	....	4½x5½	36x4k	36x7k	W
Indiana....25	2½	....	4½x5½	36x4k	36x8k	W
Indiana....35	3½	....	4⅝x5½	36x5k	36x5dk	W
Indiana....51	5	....	5 x6¼	36x5k	40x6dk	W
*International....S	¾	1500	3½x5	34x5n	34x5n	1
International....21	1	1750	3½x5½	36x3½	36x3½	1
International....31	1½	1850	3½x5¼	36x3½	36x4	1
International....41	2	2100	3½x5¼	36x3½	36x5	1
International....61	3	2400	4¼x5	36x4	36x6	1
International....101	5	3600	4¾x5	36x5	40x10	1
Jackson....4WD	3½	3850	4½x5½	36x7	36x7	B
Jumbo....15	1½	2295	3¾x5¼	36x3½	36x5	1
Jumbo....20	2	2520	3¾x5¼	35x5n	38x7n	1
Jumbo....25	2½	2660	4½x5¼	36x4	36x7	1
Jumbo....30	3	3060	4¼x5½	36x6n	42x9n	1
Jumbo....35	3½	3900	4½x6	36x5	36x10n	1
Jumbo....40	4	4400	4½x6	38x7n	44x10	1
K-Z....1	1	1750	3½x5	34x3½	34x5	W
K-Z....1½	1½	2075	3¾x5	36x4	36x6	W
K-Z....2½	2½	2550	4½x5¼	36x4	36x8	W
K-Z....3½	3½	3350	4½x5½	36x5	40x10	W
K-Z....5	5	3850	4½x5½	36x6	40x6d	W
Kalamazoo....T	1	1295	4 x5	34x5	34x5n	B
Kalamazoo....G-1	1½	2495	3¾x5	34x4	34x5	W
Kalamazoo....LG	2	2645	4 x5	36x4	36x7	W
Kalamazoo....NH	3	3145	4 x6	36x5	36x10	W
Kalamazoo....HD	3	3350	4½x6	36x5	36x10	W
Kalamazoo....LK	4	3845	4½x6	36x5	36x12	W
Kalamazoo....OK	5	4350	4½x6	36x6	40x6d	W
2Kelly-S....K-31	1½	2700	3¾x5½	36x3½	36x6	C
2Kelly-S....K-34	1½	2700	3¾x5½	36x3½	36x6	W
2Kelly-S....K-38	2½	2900	3¾x5½	36x4	36x4d	W
2Kelly-S....K-35	2½	2900	3¾x5½	36x4	36x4d	C
2Kelly-S....K-40	3½	3900	4½x6½	36x5	40x5d	C
2Kelly-S....K-41	3½	3900	4½x6½	36x5	36x10	1
2Kelly-S....K-42	3½	3900	4½x6½	36x5	40x5d	W
2Kelly-S....K-50	5	4400	4½x6½	36x6	40x6d	C
2Kelly-S....K-60	6	4600	4½x6½	36x6	40x7d	C
Keystone....40	2	2175	3¾x5½	34x5n	38x7n	1
Kimball....AB	2	3675	4 x6	36x4	36x7	W
Kimball....AC	2½	3975	4¼x6	36x4	36x8	W
Kimball....AK	3	4500	4⅜x6	36x4	36x10	W
Kimball....AE	4	5000	4¾x6	36x5	40x12	W
Kimball....AF	5	5500	5 x6	36x6	40x7d	W
*Kissel....Express	1	1535	3⅞x5½	34x5n	34x5n	W
Kissel....Utility	1½	1975	3⅞x5½	36x3½	36x5	W
Kissel....Freighter	2½	2875	4¼x5½	36x4	36x7	W
Kissel....H. D.	4	3675	4¼x5½	36x5	36x5d	W
Kleiber....AA	1	2200	4¼x5¼	34x3½k	34x5k	W
Kleiber....A	1½	3100	4½x5¼	36x3½k	36x6k	W
Kleiber....BB	2	3600	4¼x5½	36x4k	36x7k	W
Kleiber....B	2½	3950	4½x5½	36x5k	36x8	W
Kleiber....C	3½	4600	4½x5½	36x5	36x5d	W
Kleiber....D	5	5300	5 x6½	36x6	40x12	W
Koehler....D	1½	2150	3½x5	34x3½	34x5	W
Koehler....M	2½	3175	4 x5¼	36x4	36x7	W
Koehler....MCS	2½	3275	4 x5⅛	36x4	36x7	W

FINAL DRIVE:—B—Bevel, C—Chain, D—Double Reduction, I—Internal Gear, W—Worm.
r—8 cyl. s—6 cyl. t—2 cyl.—all others are 4 cyl. d—dual tires. k—pneumatic tires optional at extra cost. n—pneumatic tires. a—price includes several items of equipment. b—price includes body. *—speed truck or delivery wagon. **—Canadian Make. trac.—tractor.

1—Gramm-Pioneer. 2—Kelly-Springfield.

Specifications of Current Motor Truck Models—Continued

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES Front	TIRES Rear	Final Drive
Koehler.....F	3½	$4470	4½x5½	36x5	36x10	W
Koehler,MT. Trac	5	3275	4 x5⅛	36x4	36x7	W
Krebs-Collier..23	¾	1260	3¾x5	34x4½	34x4½	B
Krebs-Collier..24	1	1565	3¾x5	34x5	34x5	W
Krebs-Collier..45	1½	2125	4½x5½	36x4	36x7	W
Krebs-Collier..75	2½	2375	4½x5½	36x4	36x8	W
Krebs-Collier.110	3½	2975	4½x5½	36x5	40x10	W
Larrabee.....X-2	1	1925	3¼x4½	34x5n	34x5n	B
Larrabee.....U	1½	2400	3¾x5	34x3½	34x5	W
Larrabee.....J	1½-2½	2400	3¾x5	34x3½k	34x5k	W
Larrabee.....K	2½	3100	4½x5¼	36x4	36x7	W
Larrabee.....K-5	2½-3	3450	4½x5½	36x4	36x8	W
Larrabee.....L-4	3½	4000	4½x5½	36x5	36x5d	W
Larrabee.....W	5	4800	4¾x6	36x6	40x6d	W
Maccar.....L	1½	2700	4½x5¼	36x4	36x6	W
Maccar.....H-A	2	3400	4½x5¼	36x4	36x4d	W
Maccar.....H-2	3	3400	4½x5½	36x4	36x5d	W
Maccar.....H-3	4	4200	4½x5½	36x5	36x6d	W
Maccar.....G	5-6	4950	4¾x6	36x5	40x6d	W
MacDonald.....A	7½	5750	4½x6	40x7	40x14	I
Mack...AB D.R.	1½	3450	4 x5	36x4	36x3½d	D
Mack...AB Chain	1½	3000	4 x5	36x4	36x3½d	C
Mack...AB Chain	2	3300	4 x5	36x4	36x4d	C
Mack....AB D.R.	2	3750	4 x5	36x4	36x4d	D
Mack....AB D.R.	2½	3850	4 x5	36x4	36x4d	D
Mack...AB Chain	2½	3400	4 x5	36x4	36x4d	C
Mack...AC Chain	3½	4950	5 x6	36x5	40x5d	C
Mack...AC Chain	5	5500	5 x6	36x6	40x6d	C
Mack...AC Chain	6½	5750	5 x6	36x6	40x12	C
Mack...AC Chain	7½	6000	5 x6	36x7	40x7d	C
Mack Trac....AB	5	3400	4 x5	36x4	36x4d	C
Mack Trac....AC	7	4950	5 x6	36x5	40x5d	C
Mack Trac....AC	10	5500	5 x6	36x6	40x6d	C
Mack Trac....AC	13	5750	5 x6	36x6	40x12	C
Mack Trac....AC	15	6000	5 x6	36x7	40x7d	C
Mapleleaf...AA**	2	3775	4 x5¼	36x4	36x7	W
Mapleleaf...BB**	3	4350	4½x5½	36x4	36x4d	W
Mapleleaf...CC**	4	5100	4½x5½	36x5	36x5d	W
Mapleleaf..DD**	5	6200	4½x5½	36x6	40x6d	W
Master.....JW	1½	2290	4½x5½	34x3½	34x5	W
Master.....JD	1½	2590	4½x5½	34x3½	34x5	D
Master.....Z	2	2290	4½x5½	34x3½	34x5	W
Master.....W	2½	2890	4½x5½	34x4	36x7	W
Master.....DD	2½	3190	4½x5½	34x4	36x7	D
Master.....A	3½	3990	4½x6	36x5	40x5d	W
Master.....E	3½	4290	4½x6	36x5	40x5d	D
Master.....Y	4	4490	4½x6	36x5	40x6d	D
Master.....B	5	4990	4¾x6½	36x6	40x6d	W
Master.....F	5	5093	4¾x6½	36x6	40x6d	D
MasterTrac.,DDT	6	3390	4½x5½	34x4	36x7	D
*Maxwell.....1½	1½	932	3⅝x4½	32x3n	32x4n	W
Menominee...HT	1-1¼	2000	3¼x5	34x3½	36x5	W
Menominee....H	1½	2475	4 x5	36x3½	36x5	W
Menominee....D	2-2½	2875	4 x6	36x4	36x8	W
Menominee....G	3½	3800	4½x6	36x5	36x10	W
Menominee...J-3	5	4250	4¾x6	36x6	40x12	W
Moline.....10	1½	1985	3½x5	34x5n	36x6n	I
3Moreland..R. R.	1	1595	4 x5	34x5n	34x5n	B
Moreland.....BX	1½	1980	4 x5	36x3½	36x6k	W
Moreland.....EX	2	2800	4½x5¼	36x4	36x7k	W
Moreland.....AX	3	3500	4½x5½	36x5	36x10k	W
Moreland.....RX	4½-5	4600	4¾x6	36x6	40x6	W
Nas'l.....2018	1-1½	1595	3¾x5¼	35x5	36x6	I
Nash.....3018	2-2½	2150	3¾x5¾	36x6	40x8	I
Nash.....Quad.	2-2½	2750	4¼x5½	40x8	40x8	I
Nash..3018, LWB	2-2½	2200	3¾x5¾	36x6	40x8	I
Nash Quad. LWB	2-2½	2800	4¼x5½	40x8	40x8	I
Nash.....5018	2½	2250	3¾x5¼	34x4	34x6	I
4Nelson.....G2	1½	....	4½x5¼	36x3½	36x6	W
4Nelson.....G3	2½	....	4½x5¼	36x4	36x7	W
4Nelson.....G4	3½	....	4½x5½	36x5	36x5d	W
4Nelson.....G5	5	....	4¾x6	36x6	40x6d	W
Netco.....DK	2	3100	4½x5¼	36x4k	36x7k	W
Netco.....HL	2½	3500	4½x5½	36x4k	36x8k	W
Niles.....E	2	3000	4½x5¼	36x4k	36x7k	W
Noble.....B30	1½	....	3¾x5¼	36x3½	36x5	W
Noble.....C40	2	....	4 x5½	36x4	36x7	W
Noble.....D50	2½	....	4¼x5½	36x4	36x8	W
Noble.....E70	3½	....	4½x6	36x5	36x10	W
Northwestern..W	1½	2700	4½x5¼	34x4	35x6	W
Northwestern.WS	2½	3500	4½x5½	36x4	36x8	W
Norwalk.....25E	1	1595	3½x5	34x3½	34x4	W
Norwalk.....35E	1½	1925	3½x5	34x3½	34x3½d	W
Norwalk,35E.Spec	1½	2285	3¾x5¼	34x3½	34x5	W
Ogden.....A2	1	....	3½x5	34x5n	34x5n	W
Ogden.....D	1½	....	3¾x5	36x3½	36x5	W
Ogden.....E	2½	....	4½x5¼	36x4	36x8	W
Old Hickory...W	1	1775	3¾x5	36x3½k	36x4k	W
Old Reliable....A	1½	2350	4 x5	34x4	36x6	W
Old Reliable....B	2½	3500	4¼x6	34x4	36x4d	W
Old Reliable....C	3½	4250	4¼x6	36x5	36x5d	W
Old Reliable....D	5	5250	4¾x6	36x6	40x6d	W
Old ReliableKLM	7	6000	4¾x6¼	36x6	40x7d	C
*Oldsmobile Econ	1	$1095	3½x5¼	35x5n	35x5n	I
Olympic.....A	2½	3200	4¼x5½	36x4	36x8	W
Oneida.....B9	1½	2825	4 x5¼	36x3½	36x7	
Oneida.....C9	2½	3200	4 x5¼	36x4	36x8	
Oneida.....D9	3½	4050	4½x5½	36x5	36x10	
Oneida.....E9	5	4725	4½x5½	36x6	40x12	
Oshkosh.....A	2	3250	3½x5	36x6n	36x6n	B
Oshkosh.....AA	2	3400	3½x5	36x6n	36x6n	B
Oshkosh.....B	2½	3850	4 x5½	38x7n	38x7n	B
Oshkosh.....BB	2½	4000	4 x5½	38x7n	38x7n	B
*Overland.....4	½	450	3⅜x4	30x3½n	30x3½n	B
Packard.....EC	1½-3	3100	4¼x5½	36x4	36x7	W
Packard.....EX	1½-3	3100	4¼x5½	36x6n	40x8n	W
Packard.....ED	2-4½	4100	4½x5½	36x5	36x5d	W
Packard.....EF	4-7½	4500	5 x5½	36x6	40x6d	W
Paige.....52-19	1½	1950	4 x5¼	34x3½	34x5	W
Paige.....54-20	2½	2420	4¼x5½	34x4	34x8	W
Paige.....51-13	3½	3145	4½x5½	36x5	36x5d	W
Parker.....C-22	1	1875	3¾x5¼	34x5n	34x5n	W
Parker.....G-22	2½	3200	4¼x6	34x4	36x4d	W
Parker.....J-20	3½	3950	4½x6	36x5	40x5d	W
Parker.....M-20	5	4850	5 x6	36x6	40x6d	W
Patriot...Revere	1	1380	3¾x5	35x5n	35x5n	W
Patriot...Lincoln	2	2050	4 x5¼	34x3½	34x5	W
Patriot .Washgt'n	3	2900	4½x5½	36x4	36x7	W
Pierce-Arrow....	2	3200	4 x5½	36x4	36x4d	W
Pierce-Arrow....	3½	4350	4½x6⅜	36x5	36x5d	W
Pierce-Arrow....	5	4850	4½x6¾	36x5	40x6d	W
Pittsburgher.....	1½-2	3000	3⅝x5	36x4	36x6	..
Pittsburgher.....	3	3800	4⅛x5¼	36x5k	36x8	W
Power.....F	2	3150	3¾x5¼	36x5	36x7	W
Power.....C	3½	4250	4¼x5½	36x5	40x10	W
*Rainier.....R-21	¾	....	3½x5	35x5n	35x5n	W
Rainier.....R-29	1	....	3¾x5	34x3½	34x4	W
Rainier.....R-26	1½	....	3¾x5	34x3½	34x5	W
Rainier.....R-28	2	....	4¼x5¼	34x4	34x6	W
Rainier.....R-20	2½-3	....	4½x5¼	34x4	34x7	W
Rainier.....R-15	3½-5	....	4½x5½	36x5	36x5d	W
Rainier.....R-17	5-6	....	4¾x6	36x6	40x6d	W
Ranger...TK-20-2	1½	2450	3¾x5	36x6n	38x7n	W
*Reo.....F	1¼-1½	1245	4½x4½	34x4½n	34x4½n	B
Reliance.....10A	1½	2400	4 x5¼	36x3½	36x5	I
Reliance.....20B	2½	3100	4¼x5½	36x4	36x4d	I
Republic.....75	¾	1395b	3½x5	32x4½n	32x4½n	I
Republic.....10	1	1395	3¾x5	34x3	34x4	I
Republic..10 Exp	1½	1695	3¾x5	35x5n	34x5n	I
Republic.....11X	1½	1795	3¾x5	34x3½	34x6	I
Republic.....19	2½	2195	4⅛x5¼	36x4	36x7	I
Republic.....20	3½	3095	4½x5½	36x5	36x10	I
Rowe.....CW	1½	3000	3¾x5	36x6n	36x6n	W
Rowe....C.D.W.	2	3300	4 x5	34x4	36x3½d	W
Rowe....G.S.W.	3	4150	4 x6	34x5	36x5d	W
Rowe....G.P.W.	3	5250	3½x5r	38x7n	42x9n	W
Rowe.....HW	4	4500	4¼x6	36x5	36x6d	W
Rowe.....F. W.	5	5500	4½x6	36x6	40x6d	B
Ruggles.....20	1	1195	3¾x5	34x5n	34x5n	B
Ruggles.....40	2	1795	4 x5	34x5n	34x7	D
Sanford....W-15	1½	2150b	3¾x5	36x3½k	36x5k	..
Sanford.....25	2½	....	4½x5¼	36x4	36x4d	W
Sanford.....35	3½	....	4½x5½	36x5	36x5d	W
Sanford.....50	5	....	4¾x6	36x5	40x6d	W
Schacht....2-Ton	2	3200	4¼x5½	36x4	36x7	W
Schacht....3-Ton	3	3800	4¼x5½	36x5	36x5d	W
Schacht....4-Ton	4	4200	4½x6	36x5	40x5d	W
Schacht....5-Ton	5	4100	4½x6	36x5	40x6d	W
Schacht....7-Ton	7	5050	4½x6	36x6	40x7d	W
Schwartz.....A	1	1685	3½x5	34x4½n	34x4½n	B
Schwartz.....K	2	3000	3¾x5¼	34x3½	34x7	W
Schwartz.....L	3	3600	4¼x5½	36x4	36x8	W
Schwartz.....M	5	4900	4½x6	36x6	40x12	W
Selden.....30	1½	2250	3¾x5	34x3½	34x5	W
Selden.....31	1½-2½	3350	4½x5¼	34x5	38x7	W
Selden.....50	2½	3250	4½x5¼	36x4	36x7	W
Selden.....51	2½-3½	4350	4½x5½	36x6n	40x8n	W
Selden.....70	3½-5	3750	4½x5½	36x5	36x10	W
Selden.....90	5-7	4950	4¾x6	36x6	40x12	W
Seneca.....M	½	820	3½x4½	30x3½n	30x3½n	B
*Service.....12	¾	....	3¼x4½	32x4½n	32x4½n	B
*Service.....15	1½	....	3½x5	34x4½n	35x5n	B
Service.....21	1½	....	3½x5½	34x3½	34x5	W
Service.....32	2	....	4 x5½	36x3½	36x7	W
Service.....37	2	....	4¼x5½	35x5n	38x7n	W
Service.....53	3	....	4¼x5½	36x4	36x8	W
Service.....72	3½	....	4¼x5½	36x5	36x5d	W
Service.....77	4	....	4½x6	36x5	36x5d	W
Service.....102	6	....	4½x6	36x6	40x6d	W
Signal.....NF	1	$1950	3¾x5⅞	34x5n	36x6n	W
Signal.....H	1½	2450	4½x5¼	34x4	36x6	W
Signal.....J	2½	2875	4½x5¼	34x4	36x8	W
Signal.....M	3½	3675	4½x5½	36x5	40x5d	W
Signal.....R	5	4400	4¾x6	36x6	40x6d	W
Southern.....10	1	2090	3¾x5	34x3½	34x4	W
Southern.....15	1½	2590	3¾x5½	36x6n	34x4	W
Southern.....20	2	2990	4¾x5¼	36x6n	40x8k	W
*Standard.....75	1¼	1330	3¾x5	33x5n	33x5n	W
Standard.....1-K	1½	1600	3¾x5	34x3½k	34x5k	W
Standard.....76	2½-3	2400	4½x5¼	36x4k	36x7k	W
Standard.....66	3½-5	3150	4½x5½	36x5	36x10	W
Standard.....5-K	5-7	4400	4¾x6	36x6	40x12	W
Sterling.....1½	1½	2885	4 x5¾	36x3½k	36x5k	W
Sterling.....2	2	3085	4 x5¾	36x4k	36x6k	W
Sterling.....2½	2½	3290	4¾x5¾	36x4k	36x4dk	W
Sterling.....3½	3½	4325	4½x6¼	36x5k	40x5dk	W
Sterling.....5-W	5	4950	5 x6¼	36x6	40x6d	W
Sterling.....5-C	5	5500	5 x6¼	36x6	40x6d	C
Sterling.....7½	7½	6000	5 x6¼	36x6	40x7d	C
*Stewart.....14	¼-1½	1245	3⅝x5½	34x4½n	34x4½n	I
Stewart.....15	1½-1½	1445	3⅝x5½	35x5n	35x5n	I
Stewart.....9	1½-2	1790	3¾x5	34x3½	34x5	I
Stewart.....7	2-2½	2190	4¼x5¼	34x4	34x7	I
Stewart.....7-X	2½-3	2390	4¼x5½	34x4	34x7	I
Stewart.....10	3½-4	3190	4½x5½	36x5	36x5d	I
Stewart.....10-X	3½-4	3190	4½x6	36x5	36x5d	I
*Stoughton.....C	¾	1240	3½x5	34x4½n	34x4½n	W
Stoughton.....A	1	1790	3¾x5¼	34x5	34x5	W
Stoughton.....B	1½	2150	3¾x5¼	36x3½	36x5	W
Stoughton.....D	2	2490	4 x5¼	36x4	36x7	W
Stoughton.....F	3	3150	4¼x5½	36x5d	36x5d	W
Sullivan.....E	2	2800	4¼x5½	36x4k	36x7k	W
Sullivan.....H	3½	3750	4½x6	36x5	36x5d	W
*Thomart.....	1¼	1795a	4 x5¼	34x5	34x5	C
Tiffin.....GW	1½	2100	4¼x5¼	36x3½	36x5	W
Tiffin.....MW	2½	2700	4½x5¼	36x4	36x3½d	W
Tiffin.....PW	3½	3600	4½x5½	36x5	40x5d	W
Tiffin.....F50	5	4300	4¾x6	36x6	40x6d	W
Tiffin.....F60	6	4500	4¾x6	36x6	40x12	W
Titan.....	2	2750	4 x5	36x4k	36x7k	D
Titan.....	2½	2050	4¼x5½	36x4k	36x5k	D
Titan.....	3½	3950	4½x6	36x5k	40x10k	D
Titan.....	5	4550	4½x6	36x5	40x12	D
Tower.....J	1½	2000	4½x5¼	35x5	38x7	W
Tower.....H	2½	3200	4½x5¼	36x4	36x7	W
Tower.....G	3½	4100	4½x5½	36x5	36x5d	W
Traffic.....	1½	1595	3¾x5	35x5n	35x5n	I
Traffic.....C	2	1595	3¾x5	34x3½k	34x5k	I
Traffic.....	3	1895n	3¾x5	36x4	36x7	I
*Transport.....15	1	1295	3¾x5	32x4½n	32x4½n	B
Transport.....25	1½	1495	3¾x5⅛	34x3½k	34x4k	I
Transport.....35	2	1885	3¾x5	36x3½k	36x6k	I
Transport.....55	3	2385	4¼x5¼	36x4k	36x8k	I
Transport.....60	3½	2585	4¼x5½	36x4k	36x8k	I
Transport.....75	5	3485	4½x6	36x5k	36x12k	I
Traylor.....B	1½	2390	3¾x5¼	34x3½	34x5	W
Traylor.....C	2-2½	2850	4 x5½	36x4	36x7	W
Traylor.....D	3-3½	3300	4¼x5½	36x4	36x8k	W
Traylor.....F	5-6	4700	4½x6	36x6	40x6d	W
*Triangle.....AA	1	1285	3¼x5	34x4½n	34x4½n	I
Triangle.....A	1½-2	1985	3¾x5¼	34x3½k	34x6k	I
Triangle.....C	2-2½	2285	3¾x5¼	36x4k	36x6k	I
Triangle.....B	2½-3	2585	4 x5¾	36x4k	36x7k	I
Twin City...B.W.	2	2750	4 x5½	36x6	40x8	I
Twin City...A.W.	3½	3950	4¼x6	36x5	40x5d	W
5Twin City.....B	3½	....	5½x6	36x6	36x6	I
5Twin City.....A	5	....	5½x6	36x7	36x7	I
Ultimate.....A	2	3150	4 x5¼	36x3½	36x6	W
Ultimate.....AJ	2	3200	4¼x5½	36x3½	36x6	W
Ultimate.....AJL	2	3250	4¼x5½	36x3½	36x6	W
Ultimate.....B	3	3700	4¼x5½	36x4	36x4d	W
Ultimate.....BL	3	3800	4¼x5½	36x4	36x4d	W
Ultimate.....D	5	5500	5 x6½	36x6	40x12	W
Union.....FW	2½	3490	4 x6	36x5k	36x8k	D
Union.....HW	4	4650	4½x6	36x6	40x12	D
Union.....JW	6	5800	5 x6	36x6	40x14	D
United.....A	1½	2445	3¾x5¼	36x3½k	34x5k	W
United.....B	2½	3150	4¼x5½	36x4k	36x7k	W
United.....C	3½	3975	4¼x5½	36x5	36x5d	W
United.....V	5	4500	4½x6	36x6	40x6d	W
*United States..U	1	1875	3⅝x5½	34x5n	34x5n	B
UnitedStates,NW	1½	2225	3¾x5	36x5	36x3½	W
United States..N	1½	1975	3¾x5	36x3½k	36x5k	I
United States..R	3	3075	4 x5¼	36x4	36x4d	W
United States..S	4	3875	4½x5½	36x5	36x5d	W
United States..T	6	4850	4¾x6½	36x6	40x6d	W
Velie.....46	1½	1585	3¾x5	36x3½k	36x5k	I
Veteran.....M**	1½	2699	3¾x5¼	35x5n	35x5n	W
Veteran.....P**	2	3699	4¼x5½	36x4	36x7	W
Veteran.....R**	3	4200	4¼x5½	36x4	36x7	W
Veteran.....S**	4	5395	4½x6	36x5	36x10	W
*Vim.....29	½	1050	3½x4½	31x4n	31x4n	W
Vim.....30	½	1175	3½x4½	32x4½	32x4½	W
Vim.....31	1	1975	3¾x5½	35x5n	35x5n	W
Vim.....22	2	3150	3¾x5½	36x4	36x6	W
Vim.....23	3	3950	4¼x5½	36x5	36x5d	W

FINAL DRIVE:—B—Bevel, C—Chain, D—Double Reduction, I—Internal Gear, W—Worm.
r—8 cyl. s—6 cyl. t—2 cyl.—all others are 4 cyl. d—dual tires. k—pneumatic tires optional at extra cost. n—pneumatic tires. a—price includes several items of equipment. b—price includes body. *—speed truck or delivery wagon. **—Canadian Make. trac.—tractor.

3—Moreland Bon I Runner, 4—Nelson Le Moon, 5—Twin City Four Wheel Drive.

Specifications of Current Motor Truck Models—Continued

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES Front	TIRES Rear	Final Drive
Walker-JohnsonA	2	$2250	3¾x5	34x3½	34x6	W
Walker-JohnsonB	3	2750	4¼x5½	36x4	36x8	W
Walter.....S	5	4850	4½x6¼	36x6	40x6d	W
*Watson.....B	1	1865a	3¾x5¼	35x5n	35x5n	W
Watson.....N	3½	4250	4½x5½	36x5	36x10	W
Western....W1½	1½	2550	4⅛x5¼	36x31½k	36x5k	W
Western....L1½	1½	2550	3¾x5	36x31½k	36x5k	W
Western....W2½	2½	3250	4⅛x5¼	36x4	36x7	W
Western....L2½	2½	3250	4¼x6	36x4	36x7	W
Western....W3½	3½	4250	4½x6	36x5	40x5d	W
*White.....15	3¼	2400	3¾x5½	34x5n	34x5n	B
White.....20	2	3250	3¾x5½	36x4k	36x7	D
White.....40	3½	4200	3¾x5¾	36x5	40x5d	D
White.....45	5	4500	4¼x5¾	36x6	40x6d	D
White Hick.....E	1	1225	3¾x5	34x5n	34x5n	W
White Hick....H	1½	1375	3¾x5	36x3½	36x5	W
White Hick.....K	2½	1675	4⅛x5¼	36x4	36x5	W
Wichita.....K	1	1875	3¾x6¼	36x3½	36x4k	W
Wichita.....M	2	$2400	3¾x5¼	36x3½k	36x6k	W
Wichita.....RX	3	3300	4¾x5¾	36x4k	36x8k	W
Wichita.....O	4	3500	4½x6¼	36x5k	36x8k	W
Wilcox.....AA	1	1900	3¼x5½	36x1k	36x4k	W
Wilcox.....BB	1½	2550	4¼x5	36x4	36x5	W
Wilcox.....D	2½	3000	4¼x5	36x4k	36x3½dk	W
Wilcox.....E	3½	3950	4½x6	36x5k	36x5dk	W
Wilcox.....F	5	$4350	4¾x6½	36x5	40x6d	W
Wilson.....F	1½	2270	3¾x5	36x3½	36x5	W
Wilson.....EA	2½	2825	4⅛x5¼	36x4	36x7	W
Wilson.....G	3½	3685	4½x5½	36x5	36x5	W
Wilson.....H	5	4520	4¾x6	36x6	40x6	W
*Wisconsin.....A	1	1750	3¾x5	34x5n	34x5n	W,B
Wisconsin.....B	1½	2100	3¾x5	35x5	36x6	W
Wisconsin.....C	2½	2700	4 x5¾	36x6n	36x7	W
Wisconsin.....D	3½	3000	4⅝x5¾	36x6n	40x8	W
Wisconsin.....E	5	3500	4½x6¼	36x6	36x10	W
Wisconsin.....F	7	4000	5 x6¼	36x6	36x12	W
Witt-Will.....N	1½	2250	3¾x5	36x31½k	36x5k	W
Witt-Will.....P	2½	2750	4⅛x5¼	36x31½k	36x7k	W
Wolverine.....J	1	2125	3½x5	34x3	34x4	I
Wolverine.....J	1½	2375	3¾x5	34x3½	34x5	I
Wolverine.....J	2	2640	3¾x5	34x4	34x7	I
Wolverine.....J	2½	3425	4⅛x5¼	36x5	36x10	I
Wolverine.....L	3½	4100	4½x5½	36x5	36x10	I

FINAL DRIVE:—B—Bevel, C—Chain, D—Double Reduction, I—Internal Gear, W—Worm.
r—8 cyl. s—6 cyl. t—2 cyl.—all others are 4 cyl. d—dual tires. k—pneumatic tires optional at extra cost. n—pneumatic tires. a—price icludes several items of equipment, b—price includes body. *—speed truck or delivery wagon. **—Canadian Make. trac—tractor.

Specifications of Current Farm Tractor Models

TRADE NAME	Rating	Price	Wheels or Crawlers	Engine	Cylinders: Bore, Stroke	Fuel	Plow Capacity
Allis-Chal.G.P	6-12	$250	2	LeR.	4-3½x4½	Gas.	1
Allis-Chalm..	15-25	1185	4	Midw.	4-4⅛x5¼	Gas.	3
Allis-Chalm..	20-35	1885	4	Own	4-4¾x6½	GorK	3-4
‡Allis-Chalm..	20-35	2085	4	Own	4-4¾x6½	G	4
Allwork....2-G	14-28	1695	4	Own	4-4¾x6	GorK	3
Allwork.....C	14-28	1395	4	Own	4-5 x6	GorK	3
AndrewsKin.D	18-36	2500	4	Clim.	4-5 x6½	GorK	4
ARO..1921-22	3-6	385	4	Own	1-4½x5	Gas.	1
Aultman-T....	15-30	2200	4	Clim.	4-5 x6½	G,K	4
Aultman-T....	22-45	3420	4	Own	4-5½x8	G,K	6
Aultman-T....	30-60	4500	4	Own	4-7 x9	G,K,D	8-10
Automot. B-3.	12-24	1250	4	Herc.	4-4 x5½	Gas.	2-3
Avery,SR.Cul.	5-10	....	4	Own	4-3 x4	G,K	..
Avery..Cult-C	....	....	3	Own	6-3 x4	G,K	..
Avery.....B	5-10	....	4	Own	4-3 x4	G,K	2
Avery.....C	....	....	4	Own	6-3 x4	G,K	..
Avery.....	8-16	....	4	Own	2-5½x6	G,K,D	2-3
Avery.....	12-20	....	4	Own	4-4½x6	G,K,D	3-4
§Avery.....	....	....	*	Own	4-4x5½	G,K,D	3
Avery.....	12-25	....	4	Own	2-6½x7	G,K,D	3-4
Avery.....	14-28	....	4	Own	4-4⅝	G,K,D	3-4
Avery.....	18-36	....	4	Own	4-5½x6	G,K,D	4-5
Avery.....	25-50	....	4	Own	4-6½x7	G,K,D	5-6
Avery.....	45-65	....	4	Own	4-7¾x8	G,K,D	8-10
Bates Mule.H	15-25	....	4	Midw	4-4½x5¼	Gas.	3
Bates Mule..F	18-25	....	*2	Midw	4-4½x5¼	Gas.	3
‡Bates MuleG	25-35	....	*2	Midw	4-4½x6	Gas.	..
Beeman,....G	2-4	240	4	Own	1-3½x4½	Gas.	..
Best.....	18-30	3100	*2	Own	4-4¾x6½	G,K,D	4
Best.....	60	5450	*2	Own	4-6½x8½	G,K,D	8-9
Boring.....	5-10	395	4	LeR.	4-3½x4½	G	..
Boring...1921	.....	1850	3	Wauk	4-4⅜x5⅝	GorK	2
Burn-Oil, 1922	15-30	1435	4	Own	2-6¾x7	Ker.	3-4
Capital.....	15-30	1000	2	Own	4-4¼x6	Gas.	3
Case.....	12-20	1050	4	Own	4-4¼x5	G,K,D	3
Case.....	15-27	1320	4	Own	4-4½x6	GorK	3-4
Case.....	22-40	2550	4	Own	4-5½x6¾	GorK	4-5
Case....40-72	40-72	5200	4	Own	7 x8	G,K,D	8-10
Caterpillar .5T	25	....	*2	Own	4-4¾x6	Gas.	4
Caterpillar 10T	40	....	*2	Own	4-6½x7	Gas.	6
Caterpillar T35	15-25	....	2	Own	4-4 x5½	Gas.	3
Centaur.....	5-2½	345	2	N Way	2-4½x4½	GorK	1
Chicago....40	40	2500	4	Own	4-4½x6	Gas.	4
Cletrac.....F	9-16	595	*2	Own	4-3¼x4½	G,K,D	2
Cletrac.....W	12-20	1345	*2	Own	4-4 x5½	G,K,D	2-3
Dakota.....4	15-27	1500	3	Dom.	4-4¾x6	Gas.	3
Depue.....A	20-30	2500	4	Buda	4-4½x6	Gas.	4
Dill.....D	20	2380	4	Cont.	4-4½x5½	Gas.	3
Dill.....R.W.	20	2980	4	Midw.	4-4½x6	Gas.	3
Do-It-All....A	3-6	495	..	Own	1-4½x5	Gas.	1
Eagle.....F	12-22	....	4	Own	2-7 x8	GorK	3-4
Eagle.....H	16-30	....	4	Own	2-8 x8	G or K	4-5
E-B.....AA	12-20	1095	4	Own	4-4¾x5	G,K,D	3
Fageol.....D	9-18	1525	4	Lyc.	4-3½x5	Gas.	2
Farm Horse.B	18-30	1885	4	Clim.	4-5 x6½	G,K	4
Farquhar.....	15-25	....	4	Buda	4-4½x6	G,K,D	3-4
Farquhar.....	18-35	....	4	Own	4-6 x8	G,K,D	4-5
Farquhar.....	25-50	....	4	Own	4-7 x8	G,K,D	6-7
Fitch..4 Drive	20-35	1850	4	Clim.	4-5 x6½	GorK	3-4
Fordson.....	-18	$ 395	4	Own	4-4x5	G,K	2
Fox.....E	20-40	2390	4	Own	4-5½x7½	G or K	4
Franklin....G	18-30	4000	*2	Clim.	4-5 x6½	G or K	3-4
Franklin....C	18-30	3350	*2	Clim.	4-5 x6½	G or K	3 4
Franklin...G2	18-30	4350	2	Clim.	4-5 x6½	G or K	3-4
Frick.....A	12-20	....	4	Erd.	4-4 x6	G,K	2-3
Frick.....C	15-28	....	4	Beav.	4-4¾x6	G,K	3-4
Grain Belt...A	18-36	2150	4	Wauk.	4-4¾x6¾	G or K	4
Gray.....1920	18-36	....	3	Wauk	4-4¾x6¾	Gas.	4
Gt. Western St	20-30	1950	4	Beav.	4-4¾x6	K	4
Hart-Parr..20	20	765	4	Own	2-5½x6½	K,D.	2
Hart-Parr..30	30	895	4	Own	2-6½x7	K,D.	3
‡Hart-Parr....	....	1695	4	Own	6½x7	K.D.	..
Heider.....D	9-16	870	4	Wauk	4-4¼x5¾	G,K	2
Heider.....C	12-20	995	4	Wauk	4-4½x6¾	G,K	3
Heider....Cult	5-10	800	4	LeR.	4-3½x4½	Gas.	1
Huber Light 4.	12-25	1185	4	Wauk	4-4½x5¾	G or K	3
Huber Super 4	15-30	1885	4	Midw.	4-4½x6	Gas	3
Illinois.....C	15-30	....	4	Clim.	4-5 x6½	G,K	4
Imperial....E	40-70	4500	4	Own	4-7½x9	G,K,D	10
Indiana.....F	5-10	665	2	LeR.	4-3½x4½	Gas.	1-2
International.	8-16	†670	4	Own	4-4¼x5	G,K,D	2
Internatl.Titan	10-20	†700	4	Own	2-6½x8	G,K,D	3
International..	15-30	1750	4	Own	4-5¼x8	G,K,D	4
J-T.....N	20-40	....	*2	Clim.	4-5x6½	G,K,D	3-4
Lauson.....5	12-25	1235	4	Midw.	4-4½x5¼	Gas.	3
Lauson.....21	15-30	1675	4	Beav.	4-4¾x6	G or K	3-4
‡Lauson Road	15-30	2000	4	Beav.	4-4¾x6	K	....
Leader.....B	12-18	685	4	Own	2-6 x6¼	G,K,D	2-3
Leader.....N	16-32	1725	4	Clim.	4-5 x6½	G,K	3-4
‡Leader...GU	18-35	2150	*2	Clim.	4-5 x6½	G,K	3-4
Linn.....H4J	40-	4500	*	Cont.	4-4½x5½	Gas	4
Linn.....W	60	5000	*	Wauk	4-5 x6¼	Gas	6
Little Giant, B	16-22	2200	4	Own	4-4½x5	K	4
Little Giant, A	26-35	3300	4	Own	1-5½x6	K	6
Lombard.1922	85-150	8950	*2	Wisc.	6-5½x6¾	Gas.	16
Lombard.1922	50	5300	*2	Wisc.	4-4¾x6½	Gas.	6-10
Master Jr.....	5-10	585	..	LeR.	-2¾x4	Gas.	1
MerryGar1922	2	210	2	Evin	1-2¾x2½	Gas.	..
Minne...All-P	12-25	800	4	Own	4-4½x7	G or K	3
Minne. Gen.P	17-30	1600	4	Own	4-4¾x7	G or K	3-4
Minne. Med.D	22-44	2650	4	Own	4-6 x7	G or K	5-6
MinneHeavyD	35-70	3850	4	Own	4-7½x9	G or K	8-9
Mohawk .1922	8-16	650	2	Light	4-3¼x4½	K or G	1-2
Moline Univ D	9-18	....	2	Own	4-3½x5	Gas.	2-3
Moline Orch..	9-18	....	2	Own	4-3½x5	Gas.	2-3
Motor Macult.	1½	195	2	Own	1-2¾x3½	Gas.	..
NB.....1	3-6	425	4	Own	2-3¾x4	Gas.	1
Nichols-Shep.	20-42	2650	4	Own	8 x10	G or K	3-6
Nichols Shep.	25-50	3000	4	Own	9 x12	G or K	4-7
Nilson Senior..	20-40	1975	5	Wauk	4-5 x6¼	G,K	4
Oil Pull.....K	12-20	....	4	Own	2-6 x8	K,D	3
Oil Pull.....H	16-30	....	4	Own	2-7 x8½	K,D	4
Oil Pull.....G	20-40	....	4	Own	2-8 x10	K,D	5-6
Oil Pull.....E	30-60	....	4	Own	2-10x12	K,D	8-10
Oldsmar GarK	2½-5	225	4	Own	1-5½x5½	Gas.	1
Peoria.....L	12-25	$1600	4	Clim.	4-5 x6½	G,K	3
Pioneer.....G	18-36	1750	4	Own	4-5½x6	G,K,D	4
Pioneer.....C	40-75	3550	4	Own	4-7 x8	Gas.	10
Plowman.....A	15-30	1295	4	Buda	4-4½x6	G,K	3-4
Reliable.....	10-20	390	4	Own	2-6 x7	Ker.	2
Rex.....	12-25	1600	4	Wauk	4-4¼x5¾	G or K	3
Russell.....	12-24	1500	4	Own	4-4¼x5¾	G or K	2-3
Russell.....	15-30	2200	4	Own	4-5 x6½	G or K	3-4
Russell.....	20-35	3000	4	Own	4-5½x7	G or K	4-5
Russell.....	30-60	5000	4	Own	4-8 x10	G or K	8-10
Samson....M	....	445	4	Own	4-4 x5½	G,K	2
Sandusky,...J	10-20	1250	4	Own	4-4¼x5¼	G,K,D	2
Sandusky...E	15-35	1750	4	Own	4-5 x6½	G,K,D	4
Shelby.....D	15-30	....	4	Beav.	4-4¾x6	G,K	3
Shelby.....C	9-18	....	4	Wauk	4-3¾x5¼	G or K	2
Steady Pull..	12-24	1485	4	Own	4-4 x5	Gas.	3
Stinson....4E	18-30	1835	4	Beav.	4-4¾x6	G,K	4
Tioga.....3	18-32	....	4	Wisc.	4-4½x6	Gas.	3-4
Topp-Stewart.	30-45	....	4	Wauk	4-4¾x6¾	Gas.	3-4
Toro Cultivator	6	750	3	LeR	4-3½x4½	Gas.	2
ToroTractor'22	6-10	495	3	LeR	4-3½x4½	Gas.	2
Townsend....	10-20	800	2	Own	4-6½x7	Ker.	2-3
Townsend....	15-30	1350	2	Own	4-7 x8	Ker.	3-4
Townsend....	25-50	2500	2	Own	4-8½x10	Ker.	4-8
Traction Motor	40-50	....	4	....	8-3¼x5	Gas.	4-5
Traylor....TB	6-12	500	4	LeR.	4-3½x4½	Gas.	1-2
Trundaar...10	25-40	3750	*2	Wauk	4-5 x6¼	G or K	4
Twin City....	12-20	1200	4	Own	4-4¼x6	G,K	3
Twin City....	20-35	2750	4	Own	4-5½x6¾	G,K	5-6
Twin City....	40-65	4750	4	Own	4-7¾x9	G,K	8-10
Uncle Sam C20	12-20	1195	4	Weid.	4-4 x5½	G	2-3
Uncle Sam B19	20-30	1985	4	Beav.	4-4¾x6	G or K	3-4
Uncle Sam D21	20-30	1895	4	Beav.	4-4¾x6	G or K	3-4
Utilitor....501	2¼-4	295	4	Own	1-3½x4½	G	1
Utiliter...501A	2½-4	340	4	Own	1-3½x4½	G	1
Wallis.....K	15-25	†995	4	Own	4-4¼x5¾	G,K	3
Waterloo....N	12-25	675	4	Own	2-6½x7	Ker.	3
Wetmore 21-22	12-25	1185	4	Wauk	4-4 x5¾	G,K	3
Whitney....D	9-18	595	4	Own	2-5½x6½	Gas.	2
Wichita.....T	15-30	2000	4	Beav.	4-4½x6	G,K,D	3-4
Wisconsin...E	16-30	1850	4	Clim.	4-5 x6½	G or K	3
Wisconsin...F	20-40	2050	4	Wauk	4-5 x6¼	G or K	4
Wisconsin,..H	22-40	2550	4	Clim.	4-5½x7	G or K	4-6
Yuba....12-20	12-20	2400	*2	Wisc.	4-4½x6¾	G,K,D	3
Yuba....15-25	15-25	2750	*2	Wisc.	4-4¼x6	G,K,D	..
Yuba....20-35	20-35	3900	*2	Wisc.	4-5¾x7	G,K,D	4
Yuba....25-40	25-40	4250	*2	Wisc.	4-5¾x7	G,K,D	..
‡Yuba.....	25-40	4750	*2	Yuba	4-5¼x7	D	..
Zelle.....	12-25	....	4	Buda	4-4¼x5½	G or K	3

ABBREVIATIONS: G—Gasoline. K—Kerosene. D—Distillate. Plow capacity varies in relation to operating conditions. Figures are based on 14 in. plows. Engine Make: Beav.—Beaver. Clim.—Climax. Cont.—Continental. Dom.—Domas. Evin.—Evinrude. Herc.—Hercules. LeR.—LeRoy. Midw.—Midwest. Nway.—New Way. Nor.—Northway. T.C.—Twin City. Wauk.—Waukesha. Weid.—Weidely. Wis.—Wisconsin. *—Crawler type. All others are wheel type. †Price includes plows. §Track Runner. ‡Industrial Tractor.

A Regular "Man's Size" Handle

—Says QUICK-FILL JIMMIE

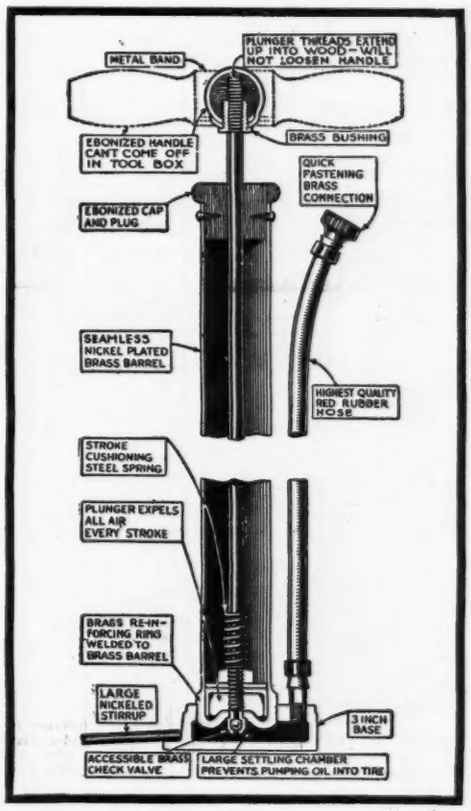
"YOU know you've got a-hold o' somethin' when you bend your food hooks 'round the handle of a Coleman Quick-Fill. It's substantial—put there for a purpose—not for decoration.

"The handle's just one of the 15 reasons why the Quick-Fill's a *better* pump. It'll pay you to get hep to all of 'em. Here's a pump that's got the jump on 'em all—and motorists want it!

"An' That Ain't Near All!"

"Full six inches of holdin' space on the handle of the Quick-Fill. That's why we call it man's size. Get next to the curve, too! Fits your hands like a good tailor fits your clothes. Blisters? Never! And it's bound to the plunger rod with a steel band that holds it like Strangler Lewis holds his title. No danger of rattlin' off to get acquainted with other things in your tool box. It's made to pump with, and, by gosh, it works!

"Garage Men and Accessory Dealers are making friends and money with Quick-Fills. The proverbial 'hotcakes' haven't got a thing on Quick-Fills when it comes to sellin'. You can tell a Quick-Fill dealer by the continuous jingle of his cash register."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EBONIZED CAP AND PLUG
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STROKE CUSHIONING STEEL SPRING
PLUNGER EXPELS ALL AIR EVERY STROKE
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LARGE NICKELED STIRRUP
3 INCH BASE
ACCESSIBLE BRASS CHECK VALVE
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Coleman Quick-Fill Tire Pump

"More Air with Less Strokes"

Specifications of Current Passenger Car Models

NAME AND MODEL	Engine Make	Cylinders, Bore and Stroke	WB	Tires	2-Pass.	5-Pass.	7-Pass.	Coupe	Sedan
Ace.....F	G-B	4-3½x5	114	32x4	$1295	$1295	....	....	$2295
Ace.....L	H-S	6-3¼x5	117	32x4	2260	2260	....	....	3680
Ace.....C	Cont.	6-3⅝x5¼	123	33x4½	2975	2975	....	....	4500
Ambassador.....R	Cont.	6-3⅝x5¼	136	33x5	....	b1500	$4500	....	6500
American.....C	H-S.	6-3¼x5	127	33x4½	b1995	1850	1925	....	2695
Anderson.....Series 49	Cont.	6-3¼x4½	120	33x4	2195	1650	1795	$2150	2550
Apperson.....8-21-S	Own	8-3¼x5	130	34x4½	....	2620	2645	3625	3695
Auburn.....6-51	Cont.	6-3¼x4½	121	32x4	1575	1575	1615	2275	2395
Bell.....4-32	H-S.	4-3½x5	114	31x4	1095	1095	....	....	....
Bell.....6-50	H-S.	6-3¼x5	124	32x4	1545	1545	....	....	....
Biddle.....B1 & B5	Buda.	4-3¼x5⅛	121	32x4	2950	b2950	....	3950	3950
Brewster.....91	Own.	4-4 x5½	125	32x4½	5900	5900	....	....	7000
Buick.....1922-31-35-36-37	Own.	4-3⅜x4¾	109	31x4	895	935	....	1295	1395
Buick.....1922-41-5-6-7	Own.	6-3⅜x4½	118	33x4½	1365	1395	....	1885	2165
Buick.....1922-48-9-50	Own.	6-3⅜x4½	124	34x4½	n1785	n1785	1585	2075	2375
Cadillac.....61	Own.	8-3⅛x5⅛	132	33x5	3100	3150	3150	d3875	4100
Case.....X	Cont.	6-3¼x4½	122	32x4½	....	1890	....	....	2790
Case.....V	Cont.	6-3⅜x5¼	126	34x4½	....	....	1935	2585	2990
Chalmers.....1922	Own.	6-3¼x4½	117	32x4	1345	1395	1495	1995	2295
Chalmers.....1922	Own.	6-3¼x4½	122	32x4	....	....	1495	....	....
Chandler.....Six	Own.	6-3½x5	123	33x4	1595	1595	1695	2295	2395
Chevrolet.....490	Own.	4-3⅛x4	102	30x3½	525	525	....	{850	875
								{k720	
Chevrolet.....FB	Own.	4-3⅛x5¼	110	32x4	975	975	....	1575	1575
Cleveland.....41	Own.	6-3 x4½	112	33x4	1175	1195	....	1550	1595
Cole.....890	Nort.	8-3⅜x4½	127¼	33x5	2485	b2485	2485	3185	3685
Columbia....Challenger	Rut.	6-3⅛x5	115	32x4	....	1195	....	1995	1995
Columbia.....DeLuxe	Cont.	6-3¼x4½	115	32x4	1475	1475	....	2295	2350
Columbia.....Light Six	Cont.	6-3⅛x4¼	115	31x4	995	985	....	....	1395
Comet.....C-53	Cont.	6-3⅛x5¼	125	33x4½	....	1985	2085	....	2985
Crawford.....22-6-60	Cont.	6-3⅛x5¼	122½	32x4	3000	3000	3000	....	4500
Daniels.....D-19	Own.	8-3½x5¼	132	34x4½	a4350	b4350	4350	5250	5950
Davis.....71	Cont.	6-3⅛x4¼	114	31x4	....	1195	....	....	....
Davis.....61-67	Cont.	6-3¼x4½	120	32x4	1595	1595	b1695	2095	2195
Dixie Flyer.....H-S-70	H-S.	4-3½x5	112	32x4	1175	1175	b1295	1545	1595
Dodge Brothers.....Own	Own.	4-3⅞x4½	114	32x4	850	880	....	{1280	1410
								{980b	
Dorris.....6-80	Own.	6-4 x5	132	33x5	....	b3970	3950	4985b	5750
Dort.....19-14	D-Ly.	4-3½x5	108	31x4	885	885	....	{1315	{1445
								{1065k	{1115k
Driggs.....Own	Own.	4-3⅝x4½	104	30x3½	1275	1275	....	....	1975
Duesenberg...Straight 8	Own.	8-2⅞x5	134	33x5	6500	6500	6750	7800	7800
Du Pont.....A	Own.	4-3⅛x5⅛	124	32x4½	3000	3200	....	3800	4000
Durant.....A-22	Cont.	4-3⅞x4¼	109	31x4	n890	890	....	1365	1365
Durant.....B-22	Anst.	6-3¼x4½	123½	32x4½	1600	1650	....	2250	2400
Earl.....40	Own.	4-3⅛x5¼	112	32x4	1485	1095	950u	....	1795
Elcar.....K-4	Lyc.	4-3½x5	118	33x4	1095	1095	u1095	1345	....
Elcar.....7-R	Cont.	6-3¼x4½	118	33x4	1395	1395	n1395	2065	2165
Elgin.....K-1	Falls.	6-3¼x4¼	118	33x4	1345	1295	b1345	2195	2195
Essex.....Own.	Own.	4-3⅜x5	108½	32x4	....	1095	....	1195k	{1895
									{1295k
Ford.....T	Own.	4-3¾x4	100	30x3½	r319	s348	u285	580	645
Franklin.....9-B	Own	6-3¼x4	115	32x4	1900	1950	u1750	2750	2850
Gardner.....T-R & G	Lyc.	4-3½x5	112	32x4	895	895	....	....	1595
Grant.....Own.	Own.	6-3⅛x4½	116	32x4	1385	1385	....	1895	1945
Gray.....Own.	Own.	4-3⅝x4	100	30x3½	....	490	....	....	760
H.C.S.....Series 3	Weid.	4-3⅜x5½	120	32x4½	2400	2400	....	2850	3150
Halladay.....4	Own.	4-3½x5	115	32x4	1095	1095	....	1990	2085
Halladay.....6	Own.	6-3⅛x5	115	32x4	1595	1595	....	2295	2395
Handley-Knight.....Own	Own.	4-4⅛x4½	125	32x4½	....	....	2650	3450	3450
Hanson.....30	Cont.	6-3⅛x4¼	112	31x4	....	995	....	....	....
Hanson Six.....60	Cont.	6-3¼x4½	121	32x4	1595	1595	1795	b2475	2585
Hatfield.....A-42	H-S.	4-3½x5	115	32x4	....	1315	b1315	1950	1950
Haynes.....75	Own.	6-3½x5⅛	132	31x4½	2395	b2395	2395	....	3395
Haynes.....55	Own.	6-3½x5	121	33x4	1645	1595	....	2295	2595
Haynes.....48	Own.	12-2¾x5	132	34x4½	2895	3595	2895	....	3895
Holmes.....Series 4	Own.	6-3¼x4¼	126	34x4½	....	b2500	2500	b3300	3600
Hudson.....Super 6	Own.	6-3½x5	126	34x4½	....	b1645	1695	2570	{2650
									{1745k
Huffman.....Cont.	Cont.	6-3⅝x4½	120	32x4	1395	1395	....	....	2295
Hupmobile.....Series R	Own.	4-3¼x5½	112	32x4	1250	1250	....	1835	1935
Jackson.....638	Cont.	6-3¼x4½	121	32x4½	....	1485	b1685	2985	2985
Jewett.....Six	Own.	6-3¼x5	112	31x4	1065	1065	....	....	1395
Jordan.....MX	Own.	6-3⅛x4¾	120	32x4	1895	1795	....	2785	2785
Kenworthy.....8-90	Own.	8-3 x5¼	130	32x4½	5000	5000	5250	6000	6000
King.....K	Own.	8-3 x5	120	32x4½	1795	1795	b1795	2400	2550
Kissel.....45	Own.	6-3⅛x5½	124	32x4½	n2385	1885	2385	b2975	3075
Kline Kar.....6-55-K	Cont.	6-3¼x4½	121	33x4	1790	1790	1790	2850	2890
LaFayette.....Own.	Own.	8-3¼x5¼	132	33x5	3985	b1090	4090	5000	5175
Leach.....999	Own.	6-3¼x5¼	134	32x4½	6500	6500	6500	6500	6500
Lexington.....22	Anst.	6-3¼x4½	123	32x4½	....	1745	....	....	....
Lexington.....T-22	Anst.	6-3¼x4½	128	32x4½	....	....	2285	....	3350
Lexington.....ST-22	Anst.	6-3¼x4½	122	32x4	....	2100	....	....	....
Liberty.....10-D	Own.	6-3½x5	117	32x4	1295	1295	b1345	2085	2245

NAME AND MODEL	Engine Make	Cylinders, Bore and Stroke	WB	Tires	2-Pass.	5-Pass.	7-Pass.	Coupe	Sedan
Lincoln.....Own.	Own.	8-3⅜x5	130	33x5	$3800	b3800	$3300	$3900	$4200
Locomobile.....48	Own.	6-4½x5½	142	35x5	....	b7600	7600	10500	11000
Maibohm.....B	Own.	6-3⅛x4½	116	32x4	1395	1395	b1495	2165	2165
Marmon.....34	Own.	6-3¾x5⅛	136	32x4½	3385	b3185	3185	3685	4385
Maxwell.....Own.	Own.	4-3⅝x4½	109	31x4	885	885	....	1385	1485
McFarlan.....1922	Own.	6-4½x6	140	33x5	6300	b6300	6300	7500	7500
Mercer.....Series 5	Own.	4-3¾x6¾	132	32x4½	3950	b3950	c3950	4850	5250
Merit.....Cont.	Cont.	6-3¼x4½	119	32x4	1895	1895	....	....	....
Mitchell.....F-50	Own.	6-3½x5	120	33x4	a1490	1490	b1690	2050	2275
Mitchell.....F-50	Own.	6-3½x5	127	32x4½	....	....	1690	....	....
Monroe.....1922-S-9	Own.	4-3¼x4½	115	32x3½	875	875	....	....	....
Moon.....6-40	Cont.	6-3⅛x4¼	115	31x4	....	1295	....	....	1695
Moon.....6-48	Cont.	6-3¼x4½	122	32x4	1785	1785	2285	2785	2785
Nash.....691-96-97	Own.	6-3¼x5	121	33x4	1360	1390	b1540	....	....
Nash.....692-94-95	Own.	6-3¼x5	127	34x4½	....	....	1540	2090	2390
Nash Four.....41-4	Own.	4-3⅝x5	112	33x4	965	985	....	{1485	{1645
								{1295k	{1350k
National.....BB	Own.	6-3½x5¼	130	32x4½	a2475	b2475	2375	3725	b3250
Noma.....3C	Cont.	6-3¼x4½	128	32x4½	2000	b2100	c2200	....	3200
Noma.....1D	Bea.	6-3½x5¼	128	32x4½	3000	b3100	c3200	....	5500
Norwalk.....430-KS	Lyc.	4-3½x5	116	32x3½	..	1035	....	....	....
Oakland.....6-44	Own.	6-2¾x4¾	115	32x4	1120	1145	b1265	{1685	1785
								{1285k	
Ogren.....6 T De Luxe	Cont.	6-3⅝x5¼	134	33x5	b3750	3750	3850	4500	4800
Oldsmobile.....43-A	Own.	4-3¼x5¼	115	32x4	....	1145	b1145	1645	1795
Oldsmobile.....46	Own.	8-2¾x4¾	122	33x4½	....	b1735	1735	....	2635
Oldsmobile.....47	Own.	8-2⅞x4½	115	32x4	1595	b1595	....	2145	2295
Overland.....4	Own.	4-3⅜x4	100	30x3½	550	550	...	850	895
Packard.....Single-Six	Own.	6-3⅜x5	126	33x4½	2485	2485	u2250	3175	3275
Packard.....Single-Six	Own.	6-3⅜x5	133	33x4½	....	u2350	2685	....	3525
Packard.....Twin Six	Own.	12-3 x6	136	35x5	3850	3850	3850	5240	5400
Paige.....6-44	Own.	6-3¼x5	119	32x4	1465	1465	u1200	1995	2245
Paige.....6-66	Cont.	6-3⅜x5	131	33x4½	a2495	n2245	2195	3100	3155
Paterson.....22-6-52	Cont.	6-3¼x4½	120	32x4½	....	1550	1585	2595	2595
Peerless.....56-S-7	Own.	8-3¼x5	125	34x4½	....	b2790	2790	3500	3790
Pierce-Arrow.....Own.	Own.	6-4 x5½	138	33x5	7000	b6500	6500	8000	8500
Pilot.....6-50	H-S.	6-3¼x5	126	32x4½	2050	2000	2050	2950	3000
Premier.....6-D	Own.	6-3⅜x5½	126¾	33x5	3150	b3100	3250	4300	5100
Premocar.....6-40-A	Falls.	6-3½x4¼	117	32x4	1095	1095	...	1750	1825
R & V Knight.....R	Own.	4-3¾x5	116	32x4	....	1665	....	2385	2475
R & V Knight.....J	Own.	6-3½x4½	127	32x4½	2475	b2475	2475	3015	3105
Reo Series...B-T6 & U6	Own.	6-3⅛x5	120	33x4	1595	....	1595	2355	2435
ReVere.....C	Dues.	4-4¼x6	131	32x4½	3200	3200	3200	....	4000
Rickenbacker.....A	Own.	6-3½x4¾	117	32x4	....	1485	....	1885	1985
Roamer.....6-54-E	Cont.	6-3½x5⅛	128	32x4½	2850	b2585	2785	3850	3850
Roamer.....4-75-E	Dues.	4-4¼x6	128	32x4½	3985	b3585	b3750n	....	b4650
Rolls-Royce.....Own.	Own.	6-4½x4¾	143½	33x5	....	10,900	....	....	....
Saxon.....125	Own.	4-3½x5	112	32x4	1195	1195	....	1795	1795
Sayers Six.....DP	Cont.	6-3¼x4½	118	33x4	1695	1695	....	2795	2795
Seneca.....L-2 & O-2	Lyc.	4-3½x5	108	30x3½	875	875	....	....	....
Seneca.....50 & 51	Lyc.	4-3½x5	112	31x4	1095	1095	....	....	....
Sperling.....A	Supr.	4-3⅜x5	114	32x4	980	980	....	1685	1685
Standard.....98	Own.	8-3¼x5	127	34x4½	2150	b2500	2500	2750	3200
Stanley.....Own.	Own.	2-4 x5	130	34x4½	2800	2600	2600	3775	3850
Stanwood Six.....Cont.	Cont.	6-3¼x4½	118	33x4	1765	1765	...	2750	....
Star.....Cont.	Cont.	4-3½x4¼	102	30x3½	r319	s348	u285	580	645
Stearns-Knight....SKL4	Own.	4-3¾x5⅝	125	34x4½	2250	2250	2450	3150	3450
Stearns-Knight.....6	Own.	6	....	....	2700	2700	2850	3500	3700
Stephens.....90	Own.	6-3¼x4½	122	33x4½	1575	b1595	c1625	2450	2550
Stevens-Duryea.....E	Own.	6-4⅞x5½	138	35x5	7250	b6900	6800	u5600	b8900
Studebaker....Light Six	Own.	6-3⅛x4½	112	32x4	1045	1045	....	1375	1750
Studebaker...Special Six	Own.	6-3½x5	119	32x4	1425	1475	b1475	2150	2350
Studebaker.....Big Six	Own.	6-3⅞x5	126	33x4½	....	n1985	1785	2500	2700
Stutz.....Own.	Own.	4-4¾x6	130	32x4½	2950	b2990	c2990	3990	4450
Templar.....A-445	Own.	4-3⅜x5½	118	32x4	2025	2125	b2175	2785	2785
Tulsa.....E-1-2-3	H-S...	4-3½x5	117	33x4	1175	1175	....	....	....
Velie.....48	Cont.	6-3¼x4½	115	32x4	1585	1585	b1800	2485	2485
Velie.....34	Falls.	6-3⅛x4½	112	32x3½	1235	1235	....	1750	2085
Velie.....58	Own.	6-3⅛x4¼	115	32x4	1395	1395	....	2085	2185
Westcott.....C-48	Cont.	6-3½x5¼	125	32x4½	....	....	1890	....	2890
Westcott.....A-44	Cont.	6-3¼x4½	120	32x4	....	1690	n1890	....	2690
Wills Sainte Claire..A-68	Own.	8-3¼x4	121	32x4½	2475	2475	....	3275	3475
Willys-Knight.....20	Own.	4-3⅝x4½	118	32x4	1350	1375	....	1875	2095
Winton.....40	Own.	6-3¾x5¼	132	35x5	3400	b3600	3400	4450	4550

a—3-passenger. b—4-passenger. c—6-passenger. n—Sport. h—All Metal Type. k—Soft Top Type. u—Chassis Price. r—Price without starter and demountable rims. Price with starter and demountable rims $414. s—Price without starter and demountable rims. Price with starter and demountable rims $443. t—Model 47—34x4½ Tires.

Engine Make: Anst—Ansted. Bea—Beaver. Cont—Continental. Curt—Curtis. D.Ly—Dort Lycoming. G-B—Grey Beal. H-S—Herscnell-Spillman. Lyc—Lycoming. Nort—Northway. Roch—Rochester. Rut—Rutenberg. Supr—Supreme. Weid—Weidely. Wisc—Wisconsin.